

¹⁴⁸ ^{Egypt.} summer, and very seldom at any other time. In 1761, however, such a quantity of rain unexpectedly fell, that a great number of houses, built with mud-walls, tumbled entirely down by being soaked with the water, to which they were unaccustomed. In the Higher Egypt the rain is still less frequent; but the people, sensible of the advantages which accrue from it, always rejoice when any falls, however insufficient to answer the purpose. This deficiency of rain is supplied by the inundation and dews already mentioned. The latter proceed, as has already been said, partly from the waters of the inundation and partly from the sea. At Alexandria, after sunset, in the month of April, the clothes exposed to the air and the terraces are soaked with them as if it had rained. These dews are more or less copious according to the direction of the wind. They are produced in the greatest quantity by the westerly and northerly winds, which blow from the sea; but the south and south-east winds, blowing over the deserts of Africa and Arabia, produce none.

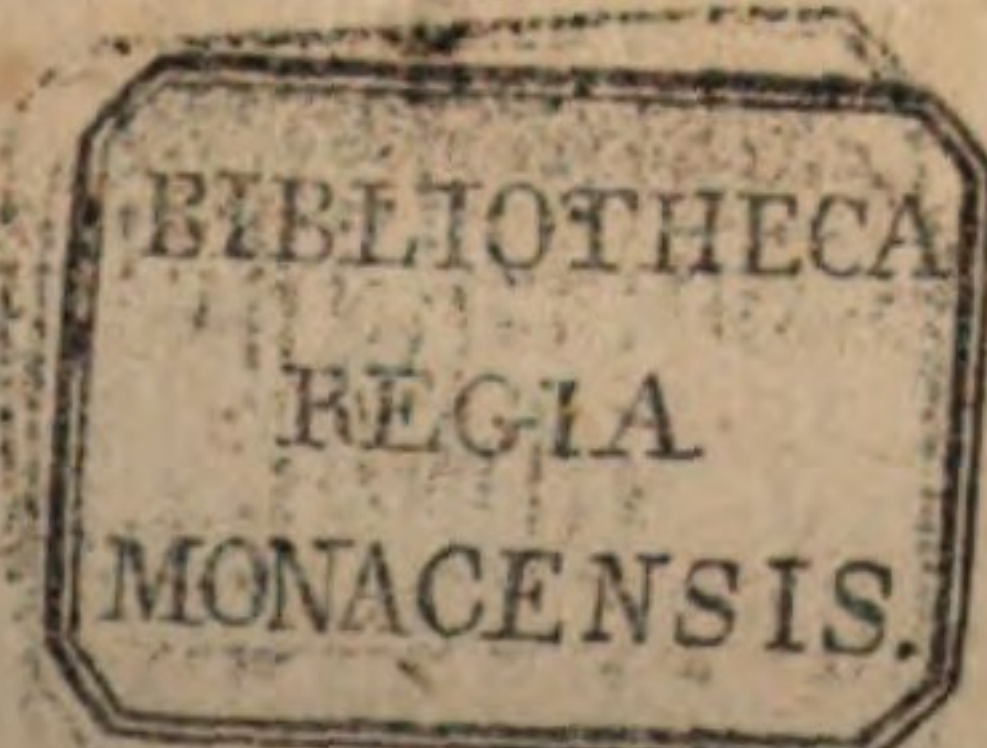
¹⁴⁹ ^{Remark-} The periodical return of winds from a certain quarter is a very remarkable phenomenon in this country. When the sun approaches the tropic of Cancer, they shift from the east to the north; and, during the month of June, they always blow from the north or north-west. They continue northerly all the month of July, varying only sometimes towards the east, and sometimes the contrary way. About the end of this month, and during the whole of August and September, they blow directly from the north, and are but of a moderate strength, though somewhat weaker in the night than in the day. Towards the end of September they return to the east, though they do not absolutely fix on that point, but blow more regularly from it than any other except the north. As the sun approaches the southern tropic, they become more variable and tempestuous, blowing most commonly from the north, north-east, and west, which they continue to do throughout the months of December, January, and February; and, during that season, the vapours raised from the Mediterranean condense into mist, or even sometimes into rain. Towards the end of February, and in the succeeding month, they more frequently blow from the south than from any other quarter. During some part of the month of March and in that of April, they blow from the south, south-east, and south-west; sometimes from the north and east, the latter becoming most prevalent about the end of that month, and continuing during the whole of May.

¹⁵⁰ ^{Rains in} It is to the long continuance of the north winds, formerly called the *Etesians winds*, that Egypt probably owes its extreme dryness, as well as part of the inundation by which it is fertilized. From the month of April to July, there appear to be two immense currents in the atmosphere, the under one blowing from the north, and the upper from the south. By the former the vapours are raised from the Mediterranean and southern parts of Europe, where they are carried over Abyssinia, dissolving there in immense deluges of rain; while by the latter the superfluous vapours, or those raised from the country of Abyssinia itself, are carried northward toward the sources of the Euphrates. Here the clouds coming from the south, descending into the lower part of the atmosphere, dissolve in like

^{Egypt.} manner into rain, and produce an inundation of the Euphrates similar to that of the Nile, and immediately succeeding it. Mr Bruce had an opportunity of ascertaining this fact in the month of June 1768; for at that time, while on a voyage from Sidon to Alexandria, he observed great numbers of thin white clouds moving rapidly from the south, and in direct opposition to the Etesian winds.

Besides the ordinary winds here spoken of, Egypt is infested with the destructive blasts common to all warm countries which have deserts in their neighbourhood. These have been distinguished by various names, such as *poisonous winds*, *hot winds of the desert*, *Samiel*, the *wind of Damascus*, *Kamsin*, and *Simoom*. In Egypt they are denominated "winds of 50 days," because they most commonly prevail during the 50 days preceding and following the equinox; though, should they blow constantly during one half of that time, an universal destruction would be the consequence. Of these travellers have given various descriptions. M. Volney says, that the violence of their heat may be compared to that of a large oven at the moment of drawing out the bread. They always blow from the south; and are undoubtedly owing to the motion of the atmosphere over such vast tracts of hot sand, where it cannot be supplied by a sufficient quantity of moisture. When they begin to blow, the sky loses its usual serenity, and assumes a dark, heavy, and alarming aspect, the sun himself laying aside his usual splendor, and becoming of a violet colour. This terrific appearance seems not to be occasioned by any real haze or cloud in the atmosphere at that time, but solely to the vast quantity of fine sand carried along by those winds, and which is so excessively subtle that it penetrates every where. The motion of this wind is always rapid, but its heat is not intolerable till after it has continued for some time. Its pernicious qualities are evidently occasioned by its excessive avidity of moisture. Thus it dries and shrivels up the skin; and by doing the same to the lungs, will in a short time produce suffocation and death. The danger is greatest to those of a plethoric habit of body, or who have been exhausted by fatigue; and putrefaction soon takes place in the bodies of such as are destroyed by it. Its extreme dryness is such, that water sprinkled on the floor evaporates in a few minutes; all the plants are withered and stripped of their leaves; and a fever is instantly produced in the human species by the suppression of perspiration. It usually lasts three days, but is altogether insupportable if it continue beyond that time. The danger is greatest when the wind blows in squalls, and to travellers who happen to be exposed to its fury without any shelter. The best method in this case is to stop the nose and mouth with an handkerchief. Camels, by a natural instinct, bury their noses in the sand, and keep them there till the squall is over. The inhabitants, who have an opportunity of retiring to their houses, instantly shut themselves up in them, or go into pits made in the earth, till the destructive blast be over.

The description of a blast of this kind which overtook Mr Bruce in the desert of Nubia is still more terrible than that just given from M. Volney. We have already mentioned something of the pillars of moving sand raised by the winds in the desert. These were observed by our traveller on this occasion in all their ter-



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rific majesty. Sometimes they appeared to move slowly; at other times with incredible swiftness, so that they could not have been avoided by the fleetest horse. Sometimes they came so near, that they threatened destruction to the whole company. Frequently the tops, when arrived at an immense height, so that they were lost in the clouds, suddenly separated from the bodies, and dispersed themselves in the air; and sometimes the whole column broke off near the middle, as if it had received a cannon shot; and their size was such, that, at the distance of about three miles, they appeared ten feet in diameter. Next day they appeared of a smaller size, but more numerous, and sometimes approached within two miles of the company. The sun was now obscured by them, and the transmission of his rays gave them a dreadful appearance, resembling pillars of fire. This was pronounced by the guide to be a sign of the approaching *Simoom* or hot wind; and he directed, that, when it came, the people should fall upon their faces and keep their mouths on the sand, to avoid the drawing in this pernicious blast with their breath. On his calling out that the *Simoom* was coming, Mr Bruce turned for a moment to the quarter from whence it came, which was the south-east. It appeared like a haze or fog of a purple colour, but less bright than the purple part of the rainbow; seemingly about 20 yards in breadth, and about 12 feet high from the ground. It moved with such rapidity, that before he could turn about and fall upon his face, he felt the vehement heat of its current upon his face; and even after it passed over, which was very quickly, the air which followed was of such an heat as to threaten suffocation. Mr Bruce had unfortunately inspired some part of the pernicious blast; by which means he almost entirely lost his voice, and became subject to an asthmatic complaint, from which he did not get free for two years. The same phenomenon occurred twice more on their journey thro' this desert. The second time, it came from the south a little to the east: but it now seemed to have a shade of blue along with the purple, and its edges were less perfectly defined; resembling rather a thin smoke, and having about a yard in the middle tinged with blue and purple. The third time, it was preceded by an appearance of sandy pillars more magnificent than any they had yet observed; the sun shining through them in such a manner as to give those which were nearest a resemblance of being spangled with stars of gold. The *simoom* which followed had the same blue and purple appearance as before, and was followed by a most suffocating wind for two hours, which reduced our travellers to the lowest degree of weakness and despondency. It was remarkable that this wind always came from the south-east, while the sandy pillars, which prognosticated its approach, affected to keep to the westward, and to occupy the vast circular space inclosed by the Nile to the west of their route, going round by Chaigie towards Dongola. The heaps of sand left by them when they fell, or raised by the whirlwinds which carried them up, were 12 or 13 feet high, exactly conical, tapering to a fine point, and their bases well proportioned.

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Of the in-
habitants of
Egypt.

The inhabitants of Egypt may now be distinguished into four distinct races of people.

1. The *Arabs*, who may be subdivided into three

classes. 1. The posterity of those who settled here immediately after the conquest of the country by Amrou Ebn Al As the khalif Omar's general. 2. The *Magrebians*, or Western Arabs, who at different times have migrated from the countries to the westward of Egypt, and are descended from the Saracen conquerors of Mauritania. 3. The *Bedouins*, or Arabs of the desert, known to the ancients by the name of *Scenites*, or dwellers in tents. The first of these classes are now found among the husbandmen and artizans; and are distinguished from the others by being of a more robust habit of body, as well as of a larger stature than the others. They are in general five feet four inches high; and many of them attain two or three inches more, and are muscular without being fleshy. Their countenances are almost black, but their features are not disagreeable; and as those of the country do not ally themselves in marriage but with the people of their own tribe, their faces have all a strong resemblance to each other. This is not the case with such as live in towns, by reason of their promiscuous marriages. The second class are more numerous in the Said, where they have villages and even distinct sovereignties of their own. Like the former, they apply themselves to agriculture and mechanical occupations. The *Bedouins* pass their lives among the rocks, ruins, and sequestered places where they can find water; sometimes uniting in tribes and living in low smoky tents, and shifting their habitations from the desert to the banks of the river and back again, as best suits their convenience. Their time of inhabiting the desert is the spring; but after the inundation they take up their residence in Egypt, in order to profit by the fertility of the country. Some farm lands in the country which they cultivate, but change annually. In general, all these *Bedouins* are robbers, and are a great terror to travellers as well as to the husbandmen; but though their number is estimated at not less than 30,000, they are dispersed in such a manner that they cannot attempt any thing of consequence.

II. The *Copts* are descendants of those inhabitants of Egypt whom the Arabs subdued, and who were composed of original Egyptians, Persians, and Greeks. M. Volney is of opinion that their name of *Copts* is only an abbreviation of the Greek word *Aigouptios*, an Egyptian. They are principally to be met with in the Said, though some also inhabit the Delta. They have all a yellowish dusky complexion, puffed up visage, swollen eyes, flat noses, and thick lips; and in fact the exact countenance of a mulatto. M. Volney, from a view of the sphynx, and finding its features to be such as is just now described, concludes, that the ancient Egyptians were real negroes; which he thinks is likewise confirmed by a passage in Herodotus, where he concludes, that the inhabitants of Colchis were descended from the Egyptians, "on account of the blackness of their skins and frizzled hair." M. Volney also remarks, that the countenance of the negroes is such as exactly represents that state of contraction assumed by our faces when strongly affected by heat. The eye-brows are knit, the cheeks rise, the eye-lids are contracted, and the mouth distorted; and this state of contraction to which the features of the negroes are perpetually exposed in the hot climates they inhabit, is become particularly characteristic. Excessive cold and snow produces the same effect; and hence

Egypt. this kind of countenance is also common among the Tartars; while, in the temperate climates, the features are proportionably lengthened, and the whole countenance expanded.

The Copts profess the Christian religion, but follow the heresy of the Eutychians, whence they have been persecuted by the Greeks; but having at last got the better of their adversaries, they are become the depositaries of the registers of the lands and tribes. At Cairo they are called *writers*; and are the intendants, secretaries, and collectors for government. The head of their class is writer to the principal chief; but they are all hated by the Turks to whom they are slaves, as well as by the peasants whom they oppress. Their language bears a great resemblance to the Greek; but they have five letters in their alphabet, as well as a number of words in their language, which may be considered as the remains of the ancient Egyptian. These are found to bear a near resemblance to the dialects of some of the neighbouring nations, as the Arabic, Ethiopian, Syriac, &c. and even of those who lived on the banks of the Euphrates. The language of the Copts, however, has fallen into disuse for upwards of 300 years. On the conquest of the country by the Saracens, the latter obliged the people to learn their language; and about the year 722 the use of the Greek tongue was prohibited throughout the whole of their empire: the Arabic language then of course became universal; while the others, being only met with in books, soon became totally neglected. The true Coptic, therefore, though there is a translation of the scriptures and many books of devotion written in it, is understood by nobody, not even the monks and priests.

III. The *Turks*, who have the title of being masters of Egypt, but are chiefly to be met with at Cairo, where they possess the religious and military employments. Formerly they possessed also the posts under government; but these are now occupied by the fourth race of inhabitants, viz.

IV. The *Mamlouks*. Of the origin of these we have already given some account: we have only, therefore, to relate some of the most remarkable particulars concerning their constitution and government, manners, &c.

These people, as has already been mentioned, are the real masters of Egypt; and in order to secure themselves in the possession of the country, they have taken several precautions. One of the principal of these is the degradation of the two military corps of azabs and janizaries, both of which were formerly very formidable. They have been able to effect this only in consequence of the corrupt and wretched government of the Turks; for before the revolt of Ibrahim Kiaya, the Turkish troops, which ought to have consisted of 40,000, were reduced to less than half that number through the avarice and malversation of their officers. Their degradation was completed by Ali Bey; who having first displaced all the officers who gave him any umbrage, left their places vacant, and so reduced the consequence of the whole, that the azabs and janizaries are now only a rabble of vagabonds, who dread the Mamlouks as much as the meanest of the populace. The principal body of the Mamlouks reside at Cairo; but many of them are dispersed through the country, in order to keep up their authority, collect the tribute, and oppress the people: yet it should seem very easy

for the Porte to dispossess them of this usurped authority, as their number is supposed not to exceed 8500, including among these a great many youth under 20 years of age.

The Mamlouks are all horsemen; and as war is accounted the only honourable employment among them, it is reckoned disgraceful to walk on foot, none but cavalry being accounted soldiers. The other inhabitants are allowed only the use of mules and asses; and the same mark of indignity is imposed upon Europeans; though, by proper management and liberal presents, this may be got over. In the year 1776 lord Algernoun Percy afterwards lord Louvaine, and the earl of Charlemont, obtained permission to ride upon horseback. The Mamlouks, however, are not incited to this continual appearance on horseback merely by their supposed superiority to the rest of the inhabitants; it is rendered necessary by their dress, which is extremely unwieldy and cumbersome. It consists of a wide shirt of thin yellowish-coloured cotton; over which is a gown of Indian linen, or some of the light stuffs of Damascus or Aleppo. Over this is a second covering of the same form and wideness, with sleeves reaching down to the ends of the fingers. The former covering is called *antari*, and the latter *castan*. The *castan* is usually made of silk or some finer stuff than the under garments; and both of them are fastened by a long belt, which divides the whole dress into two bundles. Over all these they have a third, named *djouha*, consisting of cloth without lining, and made nearly similar to the others, but that the sleeves are cut in the elbow. This coat is lined, sometimes even in summer, with fur; and as if all this was not sufficient, they have an outer covering called the *beniche*, which is the cloak or robe of ceremony; and so completely covers the body, that even the ends of the fingers are not to be seen. Thus, when the *beniche* and other accoutrements are on, the whole body appears like a long sack, with a bare neck and bald head covered with a turban thrust out of it. This turban is called a *kaouk*; and is of a cylindrical form, yellow, and turned up on the outside with a roll of muslin artificially folded up. On their feet they have a sock of yellow leather reaching up to the heels, slippers without any quarters, which consequently are always ready to be left behind in walking. Lastly, to complete this extraordinary dress, they have a kind of pantaloons or trowsers, long enough to reach up to the chin, and so large that each of the legs is big enough to contain the whole body; but that they may walk more at their ease under such a number of impediments, they tie all the loose parts of their dress with a running sash. "Thus swaddled (says M. Volney), we may imagine the Mamlouks are not very active walkers; and those who are not acquainted by experience with the prejudices of different countries, will find it scarcely possible to believe that they look on this dress as exceedingly commodious. In vain we may object that it hinders them from walking, and encumbers them unnecessarily on horseback; and that in battle a horseman once dismounted is a lost man. They reply, *It is the custom*, and every objection is answered."

In the accoutrements of their horses, the Mamlouks are almost equally absurd. The saddle is a clumsy piece of furniture, weighing with the saddle-cloths not less

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Absurd
dress and
accoutre-
ments of
the Mam-
louks.

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than 25 pounds; while the weight of the stirrups is never less than 9 or 10 pounds, nay, frequently exceeds 13. On the back-part of the saddle rises a trussquin about eight inches in height, while a pommel before projects four or five inches, in such a manner as to endanger the breast of the horseman if he should happen to stoop. Instead of a stuffed frame, they have three thick woollen coverings below the saddle; the whole being fastened by a surcingle, which, instead of a buckle, is tied with leather thongs in very complicated knots, and liable to slip. Instead of a crupper they have a large martingale which throws them upon the horse's shoulders. The stirrups are made of copper, longer and wider than the foot, having circular edges an inch high in the middle, and gradually declining toward each end. The edges are sharp, and used instead of spurs, by which means the poor animal's sides are much wounded. The weight of the furniture has already been mentioned; and is the more ridiculous as the Egyptian horses are very small. The bridle is equally ill contrived, and greatly injures the horse's mouth, especially by reason of the violent method they have of managing the animal. Their usual way is to put the horse to a full gallop, and suddenly stop him when at full speed. Thus checked by the bit, he bends in his hind legs, stiffens the fore ones, and moves along as if he scarce had joints in his body: yet, notwithstanding all those disadvantages, our author acknowledges that they are vigorous horsemen, having a martial appearance which pleases even strangers.

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Their arms,
education,
&c.

In the choice of their arms they have shown themselves more judicious. Their principal weapon is an English carbine about 30 inches long; but so large in the bore, that it can discharge 10 or 12 balls at a time, which can scarce fail of doing great execution even from the most unskilful hand. Besides two large pistols carried in the belt, they have sometimes a heavy mace at the bow of the saddle for knocking down their enemy; and by the shoulder-belt they suspend a crooked sabre measuring 24 inches in a straight line from the hilt to the point, but 30 at least in the curve. The reason of the preference given to the crooked blade is, that the effect of a straight one depends merely on the force with which it falls, and is confined to a small space, but that of a crooked one is continued longer by the action of the arm in retiring. The Mamlouks commonly procure their sabres from Constantinople, or other parts of Europe; but the beys rival each other in those of Persia and such as are fabricated of the ancient steel of Damascus. For these they frequently pay as high as 40*l.* or 50*l.* sterling; but though it must be allowed that the edge of these weapons is exquisitely keen, yet they have the defect of being almost as brittle as glass. The whole education and employment of the Mamlouks consists in the exercise of these weapons, or what is conducive to it; so that we should imagine they might at last become altogether irresistible. Every morning the greater part of them exercise themselves in a plain near Cairo, by firing their carbines and pistols in the most expeditious manner, having an earthen vessel for a mark to shoot at; and the person who breaks it is highly applauded by the beys who attend in order to encourage them. Here also they exercise themselves in the use of the sabre, as well as of the bow and arrows; though they do not any

longer make use of these last in their engagements. Their favourite diversion is throwing the *djerid*; a word properly signifying a reed, but which is generally made use of to signify any staff thrown by the hand after the manner of the Roman pilum. In this exercise they make use of the branches of the palm-tree fresh stripped. These branches, which have the form of the stalk of an artichoke, are about four feet long, and weigh five or six pounds. With these the cavaliers enter the lists, riding full speed, and throwing them afterwards at each other from a considerable distance. As soon as the assailant has thrown his weapon, he turns his horse, and his antagonist pursues in his turn. The diversion, however, frequently turns out very serious, as some are capable of throwing these weapons with force sufficient to wound their antagonists mortally. Ali Bey was particularly dexterous at this kind of sport, and frequently killed those who opposed him. All these military exercises, however, are by no means sufficient to render the Mamlouks formidable in the field. In their engagements they have neither order, discipline, nor even subordination; so that their wars are only scenes of robbery, plunder, and tumultuary encounters, which begin very often suddenly in the streets of Cairo without the least warning. If the contention happens to be transferred to the country, it is still carried on in the same manner. The strongest or most daring party pursues the other. If they are equal in courage, they will perhaps appoint a field of battle, and that without the least regard to advantages of situation, but fighting in platoons, with the boldest champions at the head of each. After mutual defiance the attack begins, and every one chooses out his man. After discharging their fire-arms, if they have an opportunity they attack with their sabres; and such as happen to be dismounted are helped up again by their servants; but if nobody happens to be near, the servants will frequently kill them for the sake of the money they carry about them. Of late, however, the ordinary Mamlouks, who are all slaves to the rest, seem convinced that their patrons are the persons principally interested; for which reason they reasonably enough conclude that they ought to encounter the greatest dangers. Hence they generally leave them to carry on the dispute by themselves; and being always sure of finding a master who will employ them, they generally return quietly to Cairo until some new revolution takes place.

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Are not
formidable
in war.

The mode of living among the Mamlouks is exceedingly expensive, as may easily be conceived from what has already been related. There is not one of them who does not cost above 100*l.* sterling annually, and many of them upwards of 200*l.* At every return of the fast of Ramadan, their masters must give them a new suit of French and Venetian cloths, with stuffs from India and Damascus. Frequently they require new horses and harness: they must likewise have pistols and sabres from Damascus, with gilt stirrups, and saddles and bridles plated with silver. The chiefs are distinguished from the vulgar by the trinkets and precious stones they wear; by riding Arabian horses of 200*l.* or 300*l.* value, wearing shawls of Cashmere in value from 25*l.* to 50*l.* each, with a variety of pelisses, the cheapest of which costs above 20*l.* Even the European merchants have given into this kind of extravagance;

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Their ex-
pensive way
of living.

^{Egypt} vagance; so that not one of them looks upon his wardrobe to be decently furnished unless it be in value 500 l. or 600 l.

¹⁵⁷
Their bad
character.

Anciently it was customary for the women to adorn their heads with sequins; but this is now rejected as not sufficiently expensive. Instead of these, diamonds, emeralds, and rubies, are now substituted; and to these they add French stuffs and laces. In other respects the character of the Mamlouks is almost the worst that can be imagined. Without affection, tie, or connection with each other or with the rest of mankind, they give themselves up without control to the most enormous vices; and, according to M. Volney, they are at once ferocious, perfidious, seditious, base, deceitful, and corrupted by every species of debauchery, not excepting even the unnatural vice; of which he tells us not one is free, this being the very first lesson each of them receives from his master, all being originally slaves, as has already been mentioned.

¹⁵⁸
Miserable
state of the
Egyptians.

As these are the present governors of Egypt, we may easily judge that the condition of the common people cannot be very agreeable. The greater part of the lands indeed are in the hands of the Mamlouks, beys, and professors of the law, the property of all others being very precarious. Contributions are to be paid, or damages repaired, every moment; and there is neither right of succession nor inheritance for real property, but every thing must be purchased from government. The peasants are allowed nothing but what is barely sufficient to sustain life. They cultivate rice and corn indeed, but are not at liberty to use either. The only food allowed them is dora or Indian millet, from which they make a kind of tasteless bread; and of this, with water and raw onions, consists all their fare throughout the year. They esteem themselves happy, therefore, if along with these they can sometimes procure a little honey, cheese, sour milk, or a few dates. They are very fond of flesh meat and fat; neither of which, however, they have an opportunity of tasting except at extraordinary festivals. Their ordinary dress consists of a shirt of coarse blue linen, and a clumsy black cloak; with a sort of black bonnet over their heads; and over all they wear a long red woollen handkerchief. Their arms, legs, and breasts, are naked, and most of them do not even wear drawers. They live in mud-walled huts of the most miserable construction, where they are exposed to the inconveniences of smoke, heat, and unwholesome air; to all which are to be added the continual fears they live in of being robbed by the Arabs, oppressed by the Mamlouks, or some other grievous calamity. The only conversation is concerning the intestine troubles and misery of the country, murders, bastinadoes, and executions. Here sentence of death is executed without the least delay or form of trial. The officers who go the rounds in the streets either by night or day, are attended by executioners, who carry along with them leathern bags for receiving the heads they cut off in these expeditions. Even the appearance of guilt is not necessary to infer a capital punishment; for frequently nothing more is requisite than the possession of wealth, or being supposed to possess it. In this case the unfortunate person is summoned before some bey; and when he makes his appearance, a sum of money is demanded of him. If he denies that he possesses it, he is thrown on his back, and receives two or three

hundred blows on the soles of his feet, nay perhaps is put to death without any ceremony. The only security of those who possess any wealth in this country therefore is, to preserve as great an appearance of poverty as possible.

Though the climate of Egypt is far from being unhealthy; yet there are not a few diseases which seem to be peculiar to it, and to have their origin either from the constitution of the atmosphere, or the manner of living of the inhabitants. One of these till lately has been supposed to be the plague; which opinion we find supported by Dr Mead, who has endeavoured to assign a natural reason why it should take its origin in this country. But it is now universally agreed, that the plague never originates in the interior parts of Egypt, but always begins at Alexandria, passing successively from thence to Rosetta, Cairo, Damietta, and the rest of the Delta. It is likewise observed, that its appearance is always preceded by the arrival of some vessel from Smyrna or Constantinople; and that, if the plague has been very violent in either of these cities, the danger to Egypt is the greater. On proper inquiry, it is found to be really a native of Constantinople; from whence it is exported by the absurd negligence of the Turks, who refuse to take any care to prevent the spreading of the infection. As they sell even the clothes of the dead without the least ceremony, and ships laden with this pernicious commodity are sent to Alexandria, it is no wonder that it should soon make its appearance there. As soon as it has reached Cairo, the European merchants shut themselves up with their families in their *khans* or lodgings, taking care to have no further communication with the city. Their provisions are now deposited at the gate of the khan, and are taken up by the porter with iron tongs; who plunges them into a barrel of water provided for the purpose. If they have occasion to speak to any person, they take care to keep at such a distance as to avoid touching or even breathing upon each other. By these precautions they certainly escape the general calamity, except by accident; and it not long ago happened that the disease was conveyed by a cat into the dwellings of the French merchants in Cairo; by which two were infected, and one died. In this manner they are imprisoned for three or four months, without any other amusement than walking on their terraces in the evenings, cards, or conversation with one another. There is a remarkable difference betwixt the plague at Constantinople and in Egypt. In the former, it is most violent in summer; and in the latter in winter, ending there always in the month of June. It is also remarkable, that the water-carriers of Egypt, whose backs are constantly wet from the nature of their occupation, never have the plague. It appears in Egypt every fourth or fifth year, when it makes such ravages as would depopulate the country, were it not for the vast concourse of strangers which arrive here every year from all parts of the Turkish empire.

A malady which seems in reality to be peculiar to Egypt is blindness. This is so common at Cairo, as M. Volney informs us, that out of 100 people whom he has met on the street, he might reckon 20 quite blind; 10 without the sight of one eye; and 20 others with their eyes red, purulent, or blemished. Almost every one, says he, wears a fillet, a token of

^{Egypt.}

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Diseases
prevalent
in this
country.

Egypt.

an approaching or convalescent ophthalmia. In considering the causes of this disorder, he reckons the sleeping upon terraces to be a principal one. The south wind, he says, cannot be the cause; otherwise the Bedouins would be equally subject to it with the Egyptians themselves: but what is with the greatest probability to be assigned as the cause, according to our author, is the very poor and little nutritive food which the natives are obliged to use. "The cheese, sour-milk, honey, confection of grapes, green fruits, and raw vegetables (says he), which are the ordinary food of the people, produce in the stomach a disorder which physicians have observed to affect the sight; the raw onions, especially, which they devour in great quantities, have a peculiar heating quality, as the monks of Syria made me remark on myself. Bodies thus nourished, abound in corrupted humours, which are constantly endeavouring a discharge. Diverted from the ordinary channels, by habitual perspiration, these humours fly to the exterior parts, and fix themselves where they find the least resistance. They therefore naturally attack the head, because the Egyptians, by shaving it once a-week, and covering it with a prodigiously hot head-dress, principally attract to it the perspiration; and if the head receives ever so slight an impression of cold on being uncovered, this perspiration is suppressed, and falls upon the teeth, or still more readily on the eyes as being the tenderest part. It will appear the more probable that the excessive perspiration of the head is a principal cause, when we reflect that the ancient Egyptians, who went bare-headed, are not mentioned by physicians as being so much afflicted with ophthalmies; though we are informed by historians that some of the Pharaohs died blind. The Arabs of the desert also, who cover the head but little, especially when young, are also very little subject to them." In this country blindness is often the consequence of the small-pox, a disorder very frequent and very fatal among the Egyptians; and no doubt the more dangerous on account of their absurd method of treating it, of which it is needless to enter into any discussion in this place. They are not unacquainted with inoculation; but seem not to be sensible of its advantages, as they very seldom practise it.

To the same cause, *viz.* unwholesome food, M. Volney ascribes the general deformity of the beggars, and the miserable appearance of the children; which he says are no where so wretched. "Their hollow eyes, pale and puffed faces, swollen bellies, meagre extremities, and yellow skins, make them always seem as if they had not long to live. Their ignorant mothers pretend that this is the effect of the *evil eye* of some envious person, who has bewitched them; and this ancient prejudice is still general in Turkey: but the real cause is the badness of their food. In spite of the talismans, therefore, an incredible number of them perish; nor is any city more fatal to the population of the neighbouring country than Grand Cairo."

The venereal disease, which, for reasons best known to themselves, the inhabitants call the *blest evil*, is so general at Cairo, that one half of the inhabitants are infected. It is extremely difficult to cure, though the symptoms are comparatively very mild, inasmuch that people who are infected with it will frequently live to the age of 80; but it is fatal to children born with the

infection, and exceedingly dangerous to such as emigrate to a colder climate.

Besides these, there are two uncommon diseases met with in Egypt, *viz.* a cutaneous eruption which returns annually; and a swelling of the testicles, which often degenerates into an enormous hydrocele. The former comes on towards the end of June or beginning of July, making its appearance in red spots and pimples all over the body, occasioning a very troublesome itching. The cause of this distemper, in M. Volney's opinion, is the corruption of the waters of the Nile, which towards the end of April become very putrid, as has already been observed. After this has been drunk for some time, the waters of the inundation, which are fresh and wholesome, tend to introduce some change in the blood and humours; whence a cutaneous eruption is the natural consequence.

The hydrocele most commonly attacks the Greeks and Copts; and is attributed to the quantity of oil they make use of, as well as to their frequent hot-bathing. Our author remarks, that "in Syria as well as in Egypt, constant experience has shown, that brandy distilled from common figs, or from the fruit of the sycamore tree, as well as from dates and the fruit of the nopal, has a most immediate effect on the testicles, which it renders hard and painful the third or fourth day after it has been drunk; and if the use of it be not discontinued, the disorder degenerates into a confirmed hydrocele. Brandy distilled from dried raisins has not the same effect: this is always mixed with aniseeds; and is very strong, being distilled three times. The Christians of Syria and the Copts of Egypt make great use of it; the latter especially drink whole bottles of it at their supper. I imagined this an exaggeration; but I have myself had ocular proofs of its truth, though nothing could equal my astonishment that such excesses do not produce instant death, or at least every symptom of the most insensible drunkenness."

In the spring season malignant fevers prevail in this country; concerning which our author mentions no remarkable particular, but that eggs are a kind of poison, and that bleeding is very prejudicial. He recommends a vegetable diet, and the bark in very large quantity.

Notwithstanding the oppression which the Egyptians labour under, a very considerable trade is carried on from Cairo. This flourishing state of commerce in the midst of the most desperate barbarity and despotism is owing to three causes. 1. That all the commodities consumed in Egypt are collected within the walls of that city. 2. That the Mamlouks and all the people of property reside in that place, and there spend their whole revenues. 3. By the situation of this city it is a centre of circulation; corresponding with Arabia and India, by the Red Sea; with Abyssinia and the interior parts of Africa, by the Nile; and with Europe and the Turkish empire, by means of the Mediterranean. A caravan comes here annually from Abyssinia, bringing from 1000 to 1200 slaves, with gum, ivory, gold-dust, ostrich-feathers, parrots, and monkeys.—Another, which sets out from the extreme parts of Morocco, takes in pilgrims for Mecca from all that country as far south as the mouth of the river Senegal. It consists of not fewer than three or four thousand camels;

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mels; and, passing along the coasts of the Mediterranean, collects likewise the pilgrims from Algiers, Tripoli, and Tunis, arriving at last at Alexandria by the way of the desert. Proceeding thence to Cairo, it joins the Egyptian caravan; and then setting out both together, they take their journey to Mecca, from whence they return in one hundred days; but the Morocco pilgrims, who have still 600 leagues to go, are upwards of a year in returning. The commodities they bring along with them are, India stuffs, shawls, gums, perfumes, pearls, and principally coffee. Besides the profits of this merchandize, considerable sums arise from the duties paid by pilgrims, and the sums expended by them.

The caravans above mentioned are not the only means by which these commodities are brought to Cairo. They arrive also at Suez, to which port the southerly winds bring in the month of May six or eight and twenty sail of vessels from Jedda. Small caravans likewise arrive from time to time from Damascus with silk and cotton stuffs, oils, and dried fruits. During the proper season there are also a number of vessels in the road of Damietta, unloading hogsheds of tobacco from Latakia, vast quantities of which are consumed in this country. For this commodity rice is taken in exchange; while other vessels bring clothing, arms, furs, passengers, and wrought silk from Constantinople. There are other vessels which come from Marseilles, Leghorn, and Venice, with cloths, cochineal, Lyons stuffs and laces, grocery ware, paper, iron, lead, Venetian sequins, and German dahlers. These are conveyed to Rosetta in barks called by M. Volney *djerm*, but which seem to be the same mentioned by Mr Bruce under the name of *canja*, and which are particularly described by him. He informs us, that there is a peculiarity in the form of this vessel which makes it useful for navigating the river Nile; and that is, that the keel is not straight, but a portion of a parabola, whose curve is almost insensible to the eye. Hence, as sand banks are very common in the Nile, and vessels are apt to strike them when the water becomes low, the middle of the *canja* will be aground while the extremities are afloat, and thus by means of oars and other assistance, it is always possible to get clear; but were the keel straight, this would be altogether impossible, by reason of the vast sails those vessels carry, which would urge them on with too much force to be recovered. The accommodation on board those vessels is much better than what could be expected: but they are liable to the depredations of robbers, who either swim under water in the day time, or upon goats skins during the night; though these seldom attack any boats where there are Europeans, whom they dread on account of their skill in fire-arms.

From so many sources we need not wonder that the commerce of Cairo should be in a very flourishing state. In 1783, according to the report of the commissioner-general of the customs, it amounted to no less than 6,250,000 l. but notwithstanding this show of wealth, the trade carried on at Cairo contributes very little to the enriching of the people. This will readily appear, when we consider, that great part of the coffee and other merchandize brought from India is exported to foreign countries, the value being paid in goods from Turkey and other European countries; while the country consumption consists entirely, or mostly, in

articles of luxury already finished, and the produce given in return is mostly in raw materials.

Schemes have frequently been projected of enlarging the commerce of Egypt by cutting through the Isthmus of Suez, and thus joining the Mediterranean and Red Seas by a canal. This is looked upon by M. Volney as impracticable. He owns, indeed, that no objection can arise from the distance, which is not more than 18 or 19 leagues; neither does any obstacle arise from mountains, or the inequality of levels, the whole being a sandy barren plain. The difficulty, which he considers as insuperable, proceeds from the nature of the corresponding coasts of the Mediterranean and Red Seas; both of which are low and sandy, where the water forms lakes, shoals, and morasses, so that ships cannot come within a considerable distance of either; and it would be scarce possible to cut a permanent canal amidst these shifting sands: not to mention, that the shore is destitute of harbours, which must be entirely the work of art. The country, besides, has not a drop of fresh water; which it would therefore be necessary to bring as far as from the Nile. The best method of effecting this junction therefore is by means of the river itself; and for this the ground is perfectly well calculated. This has been already done by several Egyptian princes, particularly Sesostris; and the canal is said to have been 170 feet wide, and deep enough for large vessels. After the Grecian conquest it was renewed by the Ptolemies, then by Trajan, and lastly by the Arabs. Part of it still remains, running from Cairo to the north-east of the *Birket-el-Hadj*, or Lake of the Pilgrims, where it loses itself. At present the commerce with Suez is only carried on by means of caravans, which set out towards the end of April or beginning of May, or in the months of July and August; waiting the arrival of the vessels, and setting out on their departure. The caravans are very numerous; that with which M. Volney travelled consisting of 5000 or 6000 men and 3000 camels. The country is as desert and barren as possible, without a single tree or the smallest spot of verdure; so that every necessary for those who accompany the caravan must be carried on the backs of the camels, wood and water not excepted.

The custom-houses of Egypt are in the hands of the Christians of Syria. Formerly they were managed by Jews; but these were completely ruined by the extortions of Ali Bey in 1769. The Syrian Christians came from Damascus somewhat more than 50 years ago; and having by their economy and industry gained possession of the most important branches of commerce, they were at length enabled to farm the custom-houses, which is an office of great consequence. There were at first only three or four families of them; but their number has since increased to more than 500, and they are reckoned very opulent.

From what has already been said concerning the state of the Egyptians, we may naturally conclude, that the arts and all kinds of learning are at a very low ebb among them. Even the most simple of the mechanical professions are still in a state of infancy. The work of their cabinet-makers, gunsmiths, and locksmiths, is extremely clumsy. There are manufactures of gunpowder and sugar; but the quality of both are very indifferent. The only thing in which they can be said to arrive at any degree of perfection is the manufacture

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Low state of the arts and learning.

Egyptians manufacture of silk stuffs; though even these are far less highly finished than those of Europe, and likewise bear a much higher price. One very extraordinary art indeed is still extant among the Egyptians, and appears to have existed in that country from the most remote antiquity; and that is a power of enchanting the most deadly serpents in such a manner, that they shall allow themselves to be handled, nay even hurt in the severest manner, without offering to bite the person who injures them. Those who have this art are named *PSYLLI*; to which article we refer for an account of what has been said on the subject by ancient and modern travellers.

For a description of those stupendous and almost indestructible monuments of human grandeur, the pyramids, so often taken notice of and described by travellers; see the article *PYRAMIDS*.

EGYPTIANS, or *GYPSES*. See *GYPSES*.

EHRETIA, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 41st order, *Asperifolia*. The fruit is a bilocular berry; the seeds solitary and bilocular; the stigma emarginated.

EHRHARTA, in botany: A genus of the monogynia order, belonging to the hexandria class of plants. The calyx is a two-valved, abbreviated, and one-flowered glume; the corolla is a double glume, each two-valved; the exterior one compressed, and scy-meter-shaped, transversely wrinkled, and gashed at the base. There are six stamina, three on each side the pistil in a parallel line. The stigma is simple, compressed, four-tufted, and torn at the top.

EHUD, the son of Gera, a Benjamite, a man left-handed, who delivered Israel from the oppression of Eglon king of Moab, under whom they served for 18 years. See *EGLON*. It being customary for the Israelites to send a present or tribute to the king of Moab; in the year of the world 2579, being the last year of their servitude, Ehud was appointed to carry it, who having a design either to free his country from this oppression, or perish in the attempt, had for this purpose provided himself with a dagger which had two edges, and which he had concealed on his right side, (Judges iii. 15, &c.). After he had delivered the present, pretending he had something of great importance to communicate to the king, he obtained a private audience of him; when taking his opportunity, he stabbed him with the poniard to the heart, and so shutting the door after him, had time to make his escape; for as the king was a very corpulent man, his attendants supposed that he was either reposing or easing himself, and therefore forbore to enter his apartment until Ehud was quite gone. As soon as he came to mount Ephraim, he gathered together the Israelites that lay nearest him, acquainted them with what he had done; and then securing the fords of Jordan that none of them might escape, he fell upon the Moabites, and subdued them.

EIA, or *EY*, in our old writers, are used for an island. Hence the names of places ending in *ey*, denotes them to be islands. Thus, Ramsey, the isle of rams; Shepey, the isle of sheep, &c.

EIA is also sometimes used for water; and hence the names of places near waters or lakes terminate in *ey*.

EJACULATOR, in anatomy, a name applied to

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two muscles of the penis from their office in the ejection of the seed. See *ANATOMY*, *Table of the Muscles*.

EICEΓÆ, called also *HEICETÆ* and *HICETÆ*, heretics of the seventh century, who made profession of the monastic life. From that passage in Exodus, where Moses and the children of Israel are said to have sung a song in praise of the Lord, after they had passed the Red Sea, wherein their enemies had perished; the *eicetæ* concluded, that they must sing and dance to praise God aright; and as Mary the prophetess, sister of Moses and Aaron, took a drum in her hand, on the same occasion, and all the women did the like, to testify their joy, by playing, beating, and dancing; the *eicetæ*, the better to imitate their conduct herein, endeavoured to draw women to them to make profession of the monastic life, and assist in their mirth.

EICK. See *BRUGES*.

EIDER-DUCK. See *ANAS*.

EIDER-Down. See *DOWN*.

EJECTA, a term used by lawyers for a woman deflowered or cast from the virtuous.

EJECTION, in the animal economy, evacuation, or the discharging any thing through some of the excretories, as by stool, vomit, &c.

EJECTION, in Scots law, is the turning out the possessor of any heritable subject by force; and is either *legal* or *illegal*. Legal ejection is where a person having no title to possess, is turned out by the authority of law. Illegal ejection is one person's violently turning another out of possession without lawful authority.

EJECTMENT, in English law, a writ or action which lies for the lessee for years, on his being ejected or put out of his land, before the expiration of his term, either by the lessor or a stranger. It may also be brought by the lessor against the lessee, for rent in arrears, or holding over his term, &c. Ejectment of late years is become an action in the place of many real actions, as writs of right, formedons, &c. which are very difficult, as well as tedious and expensive; and this is now the common action for trial of titles, and recovering of lands, &c. illegally held from the right owner; yet where entry is taken away by discent, fines, recoveries, disseisins, &c. an ejectment shall not be brought; whereby we find that all titles cannot be tried by this action.

The method of proceeding in the action of ejectment is to draw up a declaration, and feign therein a lease for three, five, or seven years, to him that would try the title; and also feign a casual ejector or defendant; and then deliver the declaration to the ejector, who serves a copy of it on the tenant in possession, and gives notice at the bottom for him to appear and defend his title; or that he the feigned defendant will suffer judgment by default, whereby the true tenant will be turned out of possession; to this declaration the tenant is to appear at the beginning of next term by his attorney, and consent to a rule to be made defendant, instead of the casual ejector, and take upon him the defence, in which he must confess lease, judgment, entry, and ouster, and at the trial stand upon the title only; but in case the tenant in possession does not appear, and enter into the said rule in time, after the declaration served, then, on affidavit being made of the service of the declaration, with the notice to appear as aforesaid,

Ekron, said, the court will order judgment to be entered against the casual ejector by default; and thereupon the tenant in possession, by writ *habere facias possessionem*, is turned out of his possession. On the trial in ejectment, the plaintiff's title is to be set forth from the person last seized in fee of the lands in question, under whom the lessor claims down to the plaintiff, proving the deeds, &c. and the plaintiff shall recover only according to the right which he has at the time of bringing his action. And here, another who hath title to the land, upon a motion made for that purpose, may be defendant in the action with the tenant in possession, to defend his title; for the possession of the lands is primarily in question, and to be recovered, which concerns the tenant, and the title thereto is tried collaterally, which may concern some other.

EKRON, a city and government of the Philistines. It fell by lot to the tribe of Judah, in the first division made by Joshua (xv. 45.), but afterwards it was given to the tribe of Dan (*id.* xix. 43.) It was situated very near the Mediterranean, between Ashdod and Jamnia. Ekron was a powerful city, and it does not appear by history that the Jews were ever sole peaceable possessors of it: the Ekronites were the first who said that it was necessary to send back the ark of the God of Israel, in order to be delivered from those calamities which the presence of it brought upon their country, (1 Sam. v. 10.) The idol Baalzebub was principally adored at Ekron (2 Kings i. 2, &c.)

ELÆAGNUS, OLEASTER, or *Wild Olive*: A genus of the monogynia order, belonging to the tetrandria class of plants; and in the natural method ranking under the 16th order, *Calycifloræ*. There is no corolla; the calyx is campanulated, quadrisid, superior; the fruit is a plum below the campanulated calyx. There are three species: 1. The spinosa, or eastern broad-leaved olive with a large fruit, is a native of the Levant and some parts of Germany. The leaves are about two inches long, and one and a half broad in the middle. They are placed alternate, and of a silver colour: at the footstalk of every leaf there comes out a pretty long sharp thorn, which are alternately longer: the flowers are small, the inside of the empalement is yellow, and they have a strong scent when fully open. 2. The inermis, without thorns, is that kind commonly preserved in the gardens of this country. The leaves are more than three inches long, and half an inch broad, and have a shining appearance like fatten. The flowers come out at the footstalks of the leaves, sometimes singly, at other times two, and sometimes three, at the same place. The outside of the empalement is silvery and fluted; the inside of a pale yellow, and having a very strong scent. The flowers appear in July, and are sometimes succeeded by fruit. 3. The latifolia, with oval leaves, is a native of Ceylon, and some other parts of India. In this country it rises with a woody stem to the height of eight or nine feet, dividing into many crooked branches, garnished with oval and silvery leaves, which have several irregular spots of a dark colour on the surface. They are placed alternately on the branches, and continue all the year.

Culture, &c. The two first may be propagated by laying down the young shoots in autumn. They will take root in one year; when they may be cut off from

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the old trees, and either transplanted into a nursery for two or three years to be trained up, or into places where they are to remain. The proper time for this is in the beginning of March or early in the autumn. They should be placed where they may be screened from high winds; for they grow very freely, and are apt to be split by the wind if they are too much exposed. The third sort is too tender to endure the open air of this country; and therefore must be kept in a warm stove, except during a short time in the warmest part of summer.

From the flowers of these plants an aromatic and cordial water has been drawn, which is said to have been successfully used in putrid and pestilential fevers. The genus *elæagnus* is not to be confounded with the oleaster or wild olive of Gerard, Parkinson, and Ray. The last is only a particular species of olive, called by Tournefort and Caspar Bauhine, *olea sylvestris*. See OLEA.

ELÆOCARPUS, in botany: A genus of the monogynia order, belonging to the polyandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is pentapetalous and lacerated; the calyx is pentaphyllous; and the fruit is a plum, with a wrinkled kernel.

ELÆOTHESIUM, in antiquity, the anointing room, or place where those who were to wrestle or had bathed anointed themselves. See GYMNASIUM.

ELAIS, in botany; a genus belonging to the natural order of *Palmeæ*. The male calyx is hexaphyllous; the corolla sixfid; the stamina six: The female calyx is hexaphyllous; the corolla hexapetalous; the stigmata three; the fruit a fibrous plum, with a three-valved nut or kernel.

ELAM (anc. geog.), a country frequently mentioned in Scripture, and lying to the south-east of Shinar. In the time of Daniel (viii. 2.), Sufiana seems to have been part of it; and before the captivity, it does not appear that the Jews called Persia by any other name. Elymæ and Elymais are often mentioned by the ancients. Ptolemy, though he makes Elymais a province of Media, yet he places the Elymæ in Sufiana, near the sea-coast. Stephanus takes it to be a part of Assyria; but Pliny and Josephus more properly of Persia, whose inhabitants this latter tells us sprang from the Elamites. The best commentators agree, that the Elamites, who were the ancestors of the Persians, were descended from Elam the son of Shem. It is likewise allowed, that the most ancient among the inspired writers constantly intend Persia, when they speak of Elam and the kingdom of Elam. Thus, not to detain the reader with unnecessary quotations, when the prophet Jeremiah (xlix. 39.), after denouncing many judgments against this country, adds these words, "But it shall come to pass in the latter days, that I will bring again the captivity of Elam, saith the Lord," he is always understood to mean the restoration of the kingdom of the Persians by Cyrus, who subdued the Babylonians, as they before had subdued the Persians.

ELAPHEBOLIA, in Grecian antiquity, a festival in honour of Diana the huntress. In the celebration a cake was made in the form of a deer (*ελαφός*), and offered to the goddesses. It owed its institution to the following circumstance: When the Phocians had been

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severely beaten by the Thessalians, they resolved, by the persuasion of one Deiphantus, to raise a pile of combustible materials, and burn their wives, children, and effects, rather than submit to the enemy. This resolution was unanimously approved by the women, who decreed Deiphantus a crown for his magnanimity. When every thing was prepared, before they fired the pile, they engaged their enemies, and fought with such desperate fury, that they totally routed them, and obtained a complete victory. In commemoration of this unexpected success, this festival was instituted to Diana, and observed with the greatest solemnity.

ELAPHEBOLIUM, in Grecian antiquity, the ninth month of the Athenian year, answering to the latter part of February and beginning of March. It consisted of 30 days; and took its name from the festival elaphebolia, kept in this month, in honour of Diana the huntress, as mentioned in the preceding article.

ELASMS, in natural history, a genus of tales, composed of small plates in form of spangles; and either single, and not farther fissile; or, if complex, only fissile to a certain degree, and that in somewhat thick laminæ.—Of these tales there are several varieties, some with large and others with small spangles, which differ also in colour and other peculiarities.

ELASTIC, in natural philosophy, an appellation given to all bodies endowed with the property of elasticity. See ELASTICITY.

ELASTIC Fluids. See AIR, ELECTRICITY, GAS, and *ELASTIC Vapours* below.

ELASTIC Resin. See CAOUTCHOUC.

ELASTIC Vapours are such as may, by any external mechanical force, be compressed into a smaller space than what they originally occupied; restoring themselves, when the pressure is taken off, to their former state with a force exactly proportioned to that with which they were at first compressed. Of this kind are all the aerial fluids without exception, and all kinds of fumes raised by means of heat whether from solid or fluid bodies.

Of these, some retain their elasticity only when a considerable degree of heat is applied to them or the substance which produces them; while others remain elastic in every degree of cold, either natural or artificial, that has yet been observed. Of the former kind are the vapours of water, spirit of wine, mercury, sal ammoniac, and all kinds of sublimable salts; of the latter, those of spirit of salt, mixtures of vitriolic acid and iron, nitrous acid, and various other metals, and in short the different species of aerial fluids indiscriminately.

The elastic force with which any one of these fluids is endowed has not yet been calculated, as being ultimately greater than any obstacle we can put in its way. Thus, if we compress the atmospherical air, we shall find that for some little time it will easily yield to the force we apply; but every succeeding moment the resistance will become stronger, and a greater and greater force must be applied in order to compress it farther. As the compression goes on, the vessel containing the air becomes hot; but no power whatever has yet been able to destroy the elasticity of the contained fluid in any degree; for upon removing the pressure, it is always found to occupy the very same space that

it did before. The case is the same with aqueous steam, to which a sufficient heat is applied to keep it from condensing into water. This will yield to a certain degree; but every moment the resistance becomes greater, until at last it will overcome any obstacles whatever. An example of the power of this kind of steam we have every day in the steam engine; and the vapours of other matters, both solid and fluid, have frequently manifested themselves to be endowed with an equal force. Thus the force of the vapours of spirit of wine has occasioned terrible accidents when the worm has been stopped, and the head of the still absurdly tied down to prevent an explosion; the vapours of mercury have burst an iron box; and those of sal ammoniac, volatile salts, nitrous acid, marine acid, phosphorus, &c. have all been known to burst the chemical vessels which confined them with great force, in such a manner as to endanger those who stood near them. In short, from innumerable observations, it may be laid down as an undoubted fact, that there is no substance whatever capable of being reduced into a state of vapour, but what in that state is endowed with an elastic force ultimately superior to any obstacle we can throw in its way.

It hath been a kind of desideratum among philosophers to give a satisfactory reason for this astonishing power of elasticity in vapour, seemingly so little capable of accomplishing any great purpose when in an unconfined state. As air is that fluid in which, from the many experiments made upon it by the air-pump and otherwise, the elastic property has most frequently been observed, the researches of philosophers were at first principally directed towards it. The causes they assigned, however, were very inadequate; being founded upon an hypothesis concerning the form of the particles of the atmosphere itself, which they supposed to be either rolled up like the springs of watches, or that they consisted of a kind of elastic flakes. This was followed by another hypothesis concerning their substance, which was imagined to be perfectly elastic, and so strong that they could not be broken by any mechanical power whatever; and thus they thought the phenomenon of the elasticity of the air might be explained. But an insuperable difficulty still attended their scheme, notwithstanding both these suppositions; for it was observed, that the elastic power of the air was augmented not only in proportion to the quantity of pressure it was made to endure, but in proportion to the degree of heat applied to it at the time. Sir Isaac Newton was aware of this difficulty; and justly concluded, that the phenomena of the air's elasticity could not be solved on any other supposition but that of a repulsive power diffused all around each of its particles, which became stronger as they approached, and weaker as they removed from each other. Hence the common phenomena of the air-pump and condensing-engine received a satisfactory explanation; but still it remained to account for the power shown in the present case by heat, as it could not be denied that this element had a very great share in augmenting the elasticity of the atmosphere, and seemed to be the only cause of elasticity in other vapours. It does not appear that Sir Isaac entered into this question, but contented himself with attributing to heat the property of

Elastic.

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Elastic. increasing repulsion, and ascribing this to another unexplored property called *rarefaction*. Thus matters stood till the great discovery made by Dr Black, that some bodies have the power of absorbing in an unknown manner the element in question, and parting with it afterwards, so that it flows out of the body which had absorbed it with the very same properties that it had before absorption. Hence many phenomena of heat, vapour, and evaporation, were explained in a manner much more satisfactory than had ever been attempted or even expected before. One of these was that remarkable property of metals becoming hot by hammering; during which operation, in the Doctor's opinion, the element of heat is squeezed out from between the particles of the metal as water is from the pores of a sponge by pressing it between the fingers. Of the same nature is the phenomenon above mentioned, that air when violently compressed becomes hot, by reason of the quantity of more subtle element squeezed out from among the particles. In this manner it appears that heat and the repulsive power of Sir Isaac Newton are the very same; that by diminishing the heat of any quantity of air, its elasticity is effectually diminished, and it will of itself shrink into a smaller space as effectually as by mechanical pressure. In one case we have what may be called ocular demonstration of the truth of this doctrine, viz. that by throwing the focus of a strong burning lens upon a small quantity of charcoal *in vacuo*, the whole will be converted into inflammable air, having even a greater power of elasticity than common air in an equal degree of heat. Here there is nothing else but heat or light to produce the elastic power, or cause the particles of charcoal which before *attracted* now to repel each other. In another case we have evidence equally strong, that the element of heat by itself, without the presence of that of light, is capable of producing the same effect. Thus when a phial of ether is put into the receiver of an air-pump, and surrounded by a small vessel of water, the ether boils violently, and is dissipated in vapour, while the water freezes, and is cooled to a great degree. The dissipation of this vapour shows that it has an elastic force; and the absorption of the heat from the water shows, that this element not only *produces* the elasticity, but actually enters into the substance of the vapour itself; so that we have not the least reason to conclude that there is any other repulsive power by which the particles are kept at a distance from one another than the substance of the heat itself. In what manner it acts, we cannot pretend exactly to explain, without making hypotheses concerning the form of the minute particles of matter, which must always be very uncertain. All known phenomena, however, concur in rendering the theory just now laid down extremely probable. The elasticity of the steam of water is exactly proportioned to the degree of heat which flows into it from without; and if this be kept up to a sufficient degree, there is no mechanical pressure which can reduce it into the state of water. This, however, may very easily be done by abstracting a certain portion of the latent heat it contains; when the elastic vapour will become a dense and heavy fluid. The same thing may be done in various ways with the permanently elastic fluids. Thus the purest dephlogisticated air, when made to part with its latent heat

by burning with iron, is converted into a gravitating substance of an unknown nature, which adheres strongly to the metal. If the decomposition is performed by means of inflammable air, both together unite into an heavy, aqueous, or acid fluid: if by mixture with nitrous air, still the heat is discernible, though less violent than in the two former cases. The decomposition indeed is slower, but equally complete, and the dephlogisticated air becomes part of the nitrous acid, from which it may be again expelled by proper means: but of these means heat must always be one; for thus only the elasticity can be restored, and the air be recovered in its proper state. The same thing takes place in fixed air, and all other permanently elastic fluids capable of being absorbed by others. The conclusion therefore which we can only draw from what data we have concerning the composition of elastic vapours is, that all of them are formed of a terrestrial substance, united with the element of heat in such a manner that part of the latter may be squeezed out from among the terrestrial particles; but in such a manner, that as soon as the pressure is taken off, the surrounding fluid rushes in, and expands them to their original bulk: and this expansion or tendency to it will be increased in proportion to the degree of heat, just as the expansion of a sponge would be exceedingly augmented, if we could contrive to convey a stream of water into the heart of it, and make the liquid flow out with violence through every pore in the circumference. In this case, it is evident that the water would act as a *power of repulsion* among the particles of the sponge, as well as the fire does among the particles of the water, charcoal, or whatever other substance is employed. Thus far we may reason from analogy; but in all probability the internal and essential texture of these vapours will for ever remain unknown. Their obvious properties, as well as some of their more latent operations in many cases, are treated of under a variety of articles in this work, as AEROLOGY, EVAPORATION, VOLCANO, &c.

It has been imagined by some, that the artificial elastic fluids have not the same mechanical property with common air, viz. that of occupying a space inversely proportional to the weights with which they are pressed: but this is found to be a mistake. All of them likewise have been found to be non-conductors of electricity, though probably not all in the same degree. Even aqueous vapour, when intimately mingled with any permanently elastic fluid, refuses to conduct this fluid, as is evident from the highly electrical state of the atmosphere in very dry weather, when we are certain that aqueous vapour must abound very much, and be intimately mixed with it. The colour of the electric spark, though it may be made visible in all kinds of permanently elastic vapours, is very different in different fluids. Thus in inflammable and alkaline air it is red or purple, but in fixed air it appears white.

ELASTICITY, or **ELASTIC Force**, that property of bodies wherewith they restore themselves to their former figure, after any external pressure.

The cause or principle of this important property elasticity, or springiness, is variously assigned. The Cartesians account for it from the *materia subtilis* making an effort to pass through pores that are too nar-

**Elastic,
Elasticity.**

Elasticity. row for it. Thus, say they, in bending, or compressing, a hard elastic body, *e. gr.* a bow, its parts recede from each other on the convex side, and approach on the concave: consequently the pores are contracted or straitened on the concave side; and if they were before round, are now, for instance, oval: so that the materia subtilis, or matter of the second element, endeavouring to pass out of those pores thus straitened, must make an effort, at the same time, to restore the body to the state it was in when the pores were more patent and round, *i. e.* before the bow was bent: and in this consists its elasticity.

Other later and more wary philosophers account for elasticity much after the same manner as the Cartesians; with this only difference, that in lieu of the subtile matter of the Cartesians, these substitute **ETHER**, or a fine ethereal medium that pervades all bodies.

Others, setting aside the precarious notion of a materia subtilis, account for elasticity from the great law of nature **ATTRACTION**, or the cause of the **COHESION** of the parts of solid and firm bodies. Thus, say they, when a hard body is struck or bent, so that the component parts are moved a little from each other, but not quite disjointed or broke off, or separated so far as to be out of the power of that attracting force whereby they cohere; they must certainly, on the cessation of the external violence, spring back to their former natural state.

Others resolve elasticity into the pressure of the atmosphere: for a violent tension, or compression, tho' not so great as to separate the constituent particles of bodies far enough to let in any foreign matter, must yet occasion many little vacuola between the separated surfaces; so that upon the removal of the force they will close again by the pressure of the aerial fluid upon the external parts. See **ATMOSPHERE**.

Lastly, others attribute the elasticity of all hard bodies to the power of resiliency in the air included within them: and so make the elastic force of the air the principle of elasticity in all other bodies.

The ELASTICITY of Fluids is accounted for from their particles being all endowed with a centrifugal force; when Sir Isaac Newton, prop. 23. lib 2. demonstrates, that particles, which naturally avoid or fly off from one another by such forces as are reciprocally proportioned to the distances of their centre, will compose an elastic fluid, whose density shall be proportional to its compression; and *vice versa*, if any fluid be composed of particles that fly off and avoid one another, and hath its density proportional to its compression, then the centrifugal forces of those particles will be reciprocally as the distances of their centres.

ELASTICITY of the Air, is the force wherewith that element dilates itself, upon removing the force whereby it was before compressed. See **AIR**, and **ATMOSPHERE**.

The elasticity or spring of the air was first discovered by Galileo. Its existence is proved by this experiment of that philosopher: An extraordinary quantity of air being intruded by means of a syringe into a glass or metal ball, till such time as the ball, with this accession of air, weigh considerably more in the balance than it did before; upon opening the mouth

thereof, the air rushes out, till the ball sink to its former weight. From hence we argue, that there is just as much air gone out, as compressed air had been crowded in. Air, therefore, returns to its former degree of expansion, upon removing the force that compressed or resisted its expansion; consequently it is endowed with an elastic force. It must be added, that as the air is found to rush out in every situation or direction of the orifice, the elastic force acts every way, or in every direction.

The elasticity of the air makes a considerable article in **PNEUMATICS**.

The cause of the elasticity of the atmosphere hath been commonly ascribed to a repulsion between its particles; but this can give us only a very slight idea of the nature of its elasticity. The term *repulsion*, like that of *attraction*, requires to be defined; and in all probability will be found in most cases to be the effect of the action of some other fluid. Thus, we find, that the elasticity of the atmosphere is very considerably affected by heat. Supposing a quantity of air heated to such a degree as is sufficient to raise Fahrenheit's thermometer to 212, it will then occupy a considerable space. If it is cooled to such a degree as to sink the thermometer to 0, it will shrink up into less than half the former bulk. The quantity of repulsive power therefore acquired by the air, while passing from one of these states to the other, is evidently owing to the heat added to or taken away from it. Nor have we any reason to suppose, that the quantity of elasticity or repulsive power it still possesses is owing to any other thing than the fire contained in it. The supposing repulsion to be a primary cause independent of all others, hath given rise to many erroneous theories, and been one very great mean of embarrassing philosophers in their accounting for the phenomena of **ELECTRICITY**.

ELATE, in botany, a genus belonging to the natural order of *Palme*. There is no male calyx; the corolla is tripetalous, with three stamina. There is no female calyx; the corolla is tripetalous, with one pistil; the fruit is an oval acuminate plum. Plate CLXXIII.

ELATER, in zoology; a genus of insects, belonging to the order of coleoptera. The antennæ are setaceous; and an elastic spring or spine projects from the hinder extremity of the breast or under side of the thorax. By means of this kind of spring, the animal, when turned upon his back, contrives to leap up into the air, and so turn itself. It varies in size; and when the insect is young and newly metamorphosed, its elytra are of a beautiful deep red; but in a few days they change to a much darker hue, and are nearly of a chestnut colour. In the state of larvæ it inhabits the trunks of decayed trees, and is there transformed. With the help of its wings it issues from its prison, flutters upon flowers, wanders over the fields, and conceals itself in thickets or under the bark of trees.

ELATERIUM, in botany: A genus of the monandria order, belonging to the monœcia class of plants; and in the natural method ranking under the 34th order, *Cucurbitaceæ*. There is no male calyx; the corolla is salver-shaped; there is no female calyx; the corolla salver-shaped; the capsule inferior, unilocular, and bivalved.

ELATERIUM, *Ελατηριον*, in pharmacy, a violently purgative

Elasticity
of
Elaterium.

Elath
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Elcesaites.

gative medicine, prepared from the wild cucumber. ELATH, or ELOTH, a part of Idumæa, situated upon the Red Sea, which David in his conquest of Edom took (2 Sam. viii. 14.), and there established a trade to all parts of the world. His son, we see, built ships in Elath, and sent them from thence to Ophir for gold, 2 Chr. viii. 17, 18. It continued in the possession of the Israelites about 150 years, till in the time of Joram, the Edomites recovered it (2 Kings viii. 20.); but it was again taken from them by Azariah, and by him left to his son, 2 Kings xiv. 22. His grandson Ahaz, however, lost it again to the king of Syria (*ib.* xvi. 6.); and the Syrians had it in their hands a long while, till after many changes under the Ptolemies, it came at length into the possession of the Romans.

ELATINE, in botany: A genus of the tetragynia order, belonging to the octandria class of plants; and in the natural method ranking under the 15th order, *Inundata*. The calyx is tetraphyllous; the petals four; the capsule quadrilocular, quadrivalved, and depressed.

ELATOSTEMA, in botany: A genus of the pentandria order, belonging to the monœcia class of plants. The male flowers have no calyx; the corolla is quinquepartite; the stamina are five filaments. There are female flowers on the same plant; these have no calyx nor corolla; the pericarpium is a very small oblong, bivalve, monospermous capsule; the seeds single and egg-shaped.

ELBE, a large river in Germany, which, rising on the confines of Silesia, runs through Bohemia, Saxony, and Brandenburg; and afterwards dividing the duchy of Luxenburg from that of Mecklenburg, as also the duchy of Bremen from Holstein, it falls into the German ocean, about 70 miles below Hamburg. It is navigable for great ships higher than any river in Europe.

ELBING, a city of Polish Prussia, in the palatinate of Marienburg, situated in E. Long. 20. 0. N. Lat. 54. 15, on a bay of the Baltic sea, called the *Frischaff*, near the mouth of the Vistula. The town is large, populous, and very well built. It is divided into two parts, called the old and new town, which are both of them very well fortified. The old town has a handsome tower, with a good college. The stadthouse and the academy are good buildings, with pleasant gardens, which are worth seeing. The place has a considerable trade, especially in sturgeon, mead, cheese, butter, and corn. It is seated in a champaign level like Holland, very fruitful and populous. The inhabitants are partly Lutherans and partly Roman Catholics. The Boors in the neighbourhood have as good houses and apparel almost as the nobility of Courland.

ELBOW, the outer angle made by the flexure or bend of the arm. That eminence whereon the arm rests, called by us *elbow*, is by the Latins called *cubitus*, and the Greeks *αγκυον*, and by others *παιεραγον*.

ELBOW is also used by architects, masons, &c. for an obtuse angle of a wall, building, or road, which diverts it from its right line.

ELCESAITES, in church-history, ancient heretics, who made their appearance in the reign of the emperor Trajan, and took their name from their leader

Elcesai. The Elcesaites kept a mean between the Jews, Christians, and Pagans; they worshipped but one God, observed the Jewish sabbath, circumcision, and the other ceremonies of the law. They rejected the Pentateuch, and the prophets; nor had they any more respect for the writings of the apostles, particularly those of St Paul.

ELDERS, or SENIORS, in Jewish history, were persons the most considerable for age, experience, and wisdom. Of this sort were the 70 men whom Moses associated to himself in the government of his people; such, likewise, afterwards were those who held the first rank in the synagogue, as presidents.

In the first assemblies of the primitive Christians, those who held the first place were called *elders*. The word *presbyter*, often used in the New Testament, is of the same signification: hence the first councils of Christians were called *presbyteria*, or *councils of elders*.

ELDERS is also a denomination still retained in the Presbyterian discipline. The elders are officers, who, in conjunction with the pastors, or ministers, and deacons, compose the consistories or kirk-sessions, meeting to consider, inspect, and regulate, matters of religion and discipline. They are chosen from among the people, and are received publicly with some degree of ceremony. In Scotland, there is an indefinite number of elders in each parish; generally about 12. See *Kirk-Sessions*, and *PRESBYTERY*.

ELDER, in botany. See *SAMBUCUS*.

ELEA, or ELIS, (anc. geog.), a district of Peloponnesus, situated between Achaia and Messenia, reaching from Arcadia quite to the west or Ionian sea: so called from ELIS, a cognominal town. See *ELIS*.

ELEATIC PHILOSOPHY, among the ancients; a name given to that of the stoics, because taught at *Ἐλεια*, in Latin *Velia*, a town of the Lucani.

The founder of this philosophy, or of the Eleatic sect, is supposed to have been Xenophanes, who lived about the 56th Olympiad, or between 500 or 600 years before Christ. This sect was divided into two parties, which may be denominated *metaphysical* and *physical*; the one rejecting, and the other approving, the appeal to fact and experiment. Of the former kind were Xenophanes, Parmenides, Melissus, and Zeno, of Elea. They are supposed to have maintained principles not very unlike those of Spinoza; they held the eternity and immutability of the world; that whatever existed was only one being; that there was neither any generation nor corruption; that this one being was immoveable and immutable, and was the true God; and whatever changes seemed to happen in the universe, they considered as mere appearances and illusions of sense. However, some learned men have supposed, that Xenophanes and his followers, speaking metaphysically, understood by the universe, or the one being, not the material world, but the originating principle of all things, or the true God, whom they expressly affirm to be incorporeal. Thus Simplicius represents them as merely metaphysical writers, who distinguished between things natural and supernatural; and who made the former to be compounded of different principles. Accordingly, Xenophanes maintained, that the earth consisted of air and fire, that all things were produced out of the earth, and the sun and stars out of clouds, and that there were four elements. Parmenides.

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Election

menides also distinguished between the doctrine concerning metaphysical objects, called *truth*, and that concerning physical or corporeal things, called *opinion*; with respect to the former there was one immoveable principle, but in the latter two that were moveable, viz. fire and earth, or heat and cold; in which particulars Zeno agreed with him. The other branch of the Eleatic sect were the atomic philosophers, who formed their system from an attention to the phenomena of nature; of these the most considerable were Leucippus, Democritus, and Protagoras.

ELECAMPANE, in botany. See INULA.

ELECT, (from *eligo*, "I choose") CHOSEN, in the Scriptures, is applied to the primitive Christians; in which sense, the elect are those chosen and admitted to the favour and blessing of Christianity.

ELECT, in some systems of theology, is a term appropriated to the saints, or the predestinated: in which sense the elect are those persons who are said to be predestinated to glory as the end, and to sanctification as the means.

ELECT is likewise applied to archbishops, bishops, and other officers, who are chosen, but not yet consecrated, or actually invested with their office or jurisdiction.

The emperor is said to be elect before he is inaugurated and crowned; a lord-mayor is elect, before his predecessor's mayoralty is expired, or the sword is put in his hands.

ELECTION, the choice that is made of any thing or person, whereby it is preferred to some other. There seems this difference, however, between choice and election, that election has usually a regard to a company or community, which makes the choice; whereas choice is seldom used but when a single person makes it.

ELECTION, in British polity, is the people's choice of their representatives in parliament. (See PARLIAMENT.) In this consists the exercise of the democratical part of our constitution: for in a democracy there can be no exercise of sovereignty but by suffrage, which is the declaration of the people's will. In all democracies, therefore, it is of the utmost importance to regulate by whom, and in what manner, the suffrages are to be given. And the Athenians were so justly jealous of this prerogative, that a stranger, who interfered in the assemblies of the people, was punished by their laws with death; because such a man was esteemed guilty of high treason, by usurping those rights of sovereignty to which he had no title. In Britain, where the people do not debate in a collective body, but by representation, the exercise of this sovereignty consists in the choice of representatives. The laws have therefore very strictly guarded against usurpation or abuse of this power, by many salutary provisions; which may be reduced to these three points, 1. The qualifications of the electors. 2. The qualifications of the elected. 3. The proceedings at elections.

(1.) As to the qualifications of the electors. The true reason of requiring any qualification, with regard to property, in voters, is to exclude such persons as are in so mean a situation, that they are esteemed to have no will of their own. If these persons had votes, they would be tempted to dispose of them under some un-

due influence or other. This would give a great, an artful, or a wealthy man, a larger share in elections than is consistent with general liberty. If it were probable that every man would give his vote freely, and without influence of any kind; then, upon the true theory and genuine principles of liberty, every member of the community, however poor, should have a vote in electing those delegates to whose charge is committed the disposal of his property, his liberty, and his life. But since that can hardly be expected in persons of indigent fortunes, or such as are under the immediate dominion of others, all popular states have been obliged to establish certain qualifications; whereby some, who are suspected to have no will of their own, are excluded from voting, in order to set other individuals, whose will may be supposed independent, more thoroughly upon a level with each other.

And this constitution of suffrages is framed upon a wiser principle, with us, than either of the methods of voting, by centuries or by tribes, among the Romans. In the method by centuries, instituted by Servius Tullius, it was principally property, and not numbers, that turned the scale: in the method by tribes, gradually introduced by the tribunes of the people, numbers only were regarded, and property entirely overlooked. Hence the laws passed by the former method had usually too great a tendency to aggrandize the patricians or rich nobles: and those by the latter had too much of a levelling principle. Our constitution steers between the two extremes. Only such are entirely excluded as can have no will of their own: there is hardly a free agent to be found, but what is intitled to a vote in some place or other in the kingdom. Nor is comparative wealth, or property, entirely disregarded in elections; for though the richest man has only one vote at one place, yet, if his property be at all diffused, he has probably a right to vote at more places than one, and therefore has many representatives. This is the spirit of our constitution: not that we assert it is in fact quite so perfect as we have endeavoured to describe it; for if any alteration might be wished or suggested in the present form of parliaments, it should be in favour of a more complete representation of the people.

But to return to the qualifications; and first those of electors for knights of the shire. 1. By statute 8 Hen. VI. c. 7. and 10 Hen. VI. c. 2. (amended by 14 Geo. III. c. 58.) the knights of the shire shall be chosen of people, whereof every man shall have freehold to the value of forty shillings by the year within the county; which (by subsequent statutes) is to be clear of all charges and deductions, except parliamentary and parochial taxes. The knights of shires are the representatives of the landholders, or landed interest of the kingdom: their electors must therefore have estates in lands or tenements within the county represented. These estates must be freehold, that is, for term of life at least; because beneficial leases for long terms of years were not in use at the making of these statutes, and copyholders were then little better than villeins, absolutely dependent upon their lords. This freehold must be of 40 shillings annual value; because that sum would then, with proper industry, furnish all the necessaries of life, and render the freeholder, if he pleased, an independent man: For bishop Fleetwood,

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Comment.

Election. in his *chronicon preciosum*, written at the beginning of the present century, has fully proved 40 shillings in the reign of Henry VI. to have been equal to 12 pounds *per annum* in the reign of Queen Anne; and, as the value of money is very considerably lowered since the bishop wrote, we may fairly conclude, from this and other circumstances, that what was equivalent to 12 pounds in his days, is equivalent to 20 at present. The other less important qualifications of the electors for counties in England and Wales may be collected from the statutes cited below (A); which direct, 2. That no person under 21 years of age shall be capable of voting for any member. This extends to all sorts of members as well for boroughs as counties; as does also the next, *viz.* 3. That no person convicted of perjury, or subornation of perjury, shall be capable of voting in any election. 4. That no person shall vote in right of any freehold, granted to him fraudulently to qualify him to vote. Fraudulent grants are such as contain an agreement to reconvey, or to defeat the estate granted; which agreements are made void, and the estate is absolutely vested in the person to whom it is so granted. And, to guard the better against such frauds, it is farther provided, 5. That every voter shall have been in the actual possession, or receipt of the profits, of his freehold to his own use for 12 kalendar months before; except it came to him by descent, marriage, marriage-settlement, will, or promotion to a benefice or office. 6. That no person shall vote in respect of an annuity or rent-charge, unless registered with the clerk of the peace 12 kalendar months before. 7. That in mortgaged or trust-estates, the person in possession, under the abovementioned restrictions, shall have the vote. 8. That only one person shall be admitted to vote for any one house or tenement, to prevent the splitting of freeholds. 9. That no estate shall qualify a voter, unless the estate has been assessed to some land-tax aid, at least 12 months before the election. 10. That no tenant by copy of court-roll shall be permitted to vote as a freeholder. Thus much for the electors in counties.

As for the electors of citizens and burghesses, these are supposed to be the mercantile part or trading interest of this kingdom. But as trade is of a fluctuating nature, and seldom long fixed in a place, it was formerly left to the crown to summon, *pro re nata*, the most flourishing towns to send representatives to parliament. So that as towns increased in trade, and grew populous, they were admitted to a share in the legislature. But the misfortune is, that the deserted boroughs continued to be summoned, as well as those to whom their trade and inhabitants were transferred; except a few which petitioned to be eased of the expence, then usual, of maintaining their members: four shillings a-day being allowed for a knight of the shire, and two shillings for a citizen or burghess; which was the rate of wages established in the reign of Edward III. Hence the members for boroughs now bear above a quadruple proportion to those for counties; and the number of parliament men is increased since Fortescue's time, in the reign of Henry VI. from 300 to upwards of 500,

Election. exclusive of those for Scotland. The universities were, in general, not empowered to send burghesses to parliament; though once, in 28 Edw. I. when a parliament was summoned to consider of the king's right to Scotland, there were issued writs, which required the university of Oxford to send up four or five, and that of Cambridge two or three, of their most discreet and learned lawyers for that purpose. But it was king James I. who indulged them with the permanent privilege to send constantly two of their own body; to serve for those students who, though useful members of the community, were neither concerned in the landed nor the trading interest; and to protect in the legislature the rights of the republic of letters. The right of election in boroughs is various, depending entirely on the several charters, customs, and constitutions of the respective places; which has occasioned infinite disputes: tho' now, by statute 2 Geo. II. c. 24. the right of voting for the future shall be allowed according to the last determination of the house of commons concerning it; and, by statute 3 Geo. III. c. 15. no freeman of any city or borough (other than such as claim by birth, marriage, or servitude) shall be intitled to vote therein, unless he hath been admitted to his freedom 12 kalendar months before.

(2.) Next, as to the qualifications of persons to be elected members of the house of commons. Some of these depend upon the law and custom of parliaments, declared by the house of commons; others upon certain statutes. And from these it appears, 1. That they must not be aliens born or minors. 2. That they must not be any of the 12 judges, because they sit in the lords' house; nor of the clergy, for they sit in the convocation; nor persons attainted of treason, or felony, for they are unfit to sit any where. 3. That sheriffs of counties, and mayors and bailiffs of boroughs, are not eligible in their respective jurisdictions, as being returning officers; but that sheriffs of one county are eligible to be knights of another. 4. That, in strictness, all members ought to have been inhabitants of the places for which they are chosen; but this, having been long disregarded, was at length entirely repealed by statute 14 Geo. III. c. 58. 5. That no persons concerned in the management of any duties or taxes created since 1692, except the commissioners of the treasury, nor any of the officers following (*viz.* commissioners of prizes, transports, sick and wounded, wine-licences, navy, and victualling; secretaries or receivers of prizes; comptrollers of the army-accounts; agents for regiments; governors of plantations, and their deputies; officers of Minorca or Gibraltar; officers of the excise and customs; clerks or deputies in the several offices of the treasury, exchequer, navy, victualling, admiralty, pay of the army or navy, secretaries of state, salt, stamps, appeals, wine-licences, hackney-coaches, hawkers, and pedlars), nor any persons that hold any new office under the crown created since 1705, are capable of being elected or sitting as members. 6. That no person having a pension under the crown during pleasure, or for any term of years, is capable of being elected or sitting. 7. That if any mem-

(A) 7 and 8 Will. III. c. 25. 10 Ann. c. 23. 2 Geo. II. c. 21. 18 Geo. II. c. 18. 31 Geo. II. c. 14. 3 Geo. III. c. 24.

Election.

member accepts an office under the crown, except an officer in the army or navy accepting a new commission, his seat is void; but such member is capable of being re-elected. 8. That all knights of the shire shall be actual knights, or such notable esquires and gentlemen as have estates sufficient to be knights, and by no means of the degree of yeomen. This is reduced to a still greater certainty, by ordaining, 9. That every knight of a shire shall have a clear estate of freehold or copyhold to the value of 600 l. *per annum*, and every citizen and burgess to the value of 300 l.: except the eldest sons of peers and of persons qualified to be knights of shires, and except the members for the two universities: which somewhat balances the ascendant which the boroughs have gained over the counties, by obliging the trading interest to make choice of landed men: and of this qualification the member must make oath, and give in the particulars in writing, at the time of his taking his seat. But, subject to these standing restrictions and disqualifications, every subject of the realm is eligible of common right: though there are instances, wherein persons in particular circumstances have forfeited that common right, and have been declared ineligible *for that parliament*, by a vote of the house of commons; or *for ever*, by an act of the legislature. But it was an unconstitutional prohibition, which was grounded on an ordinance of the house of lords, and inserted in the *king's writs*, for the parliament holden at Coventry, 6 Hen. IV. that no apprentice or other man of the law should be elected a knight for the shire therein: in return for which, our law-books and historians have branded this parliament with the name of *parliamentum indoctum*, or the lack-learning parliament; and Sir Edward Coke observes with some spleen, that there was never a good law made thereat.

(3.) The third point, regarding elections, is the method of proceeding therein. This is also regulated by the law of parliament, and the several statutes referred to in the margin below, (a); all which we shall blend together, and extract out of them a summary account of the method of proceeding to elections.

As soon as the parliament is summoned, the lord chancellor (or if a vacancy happens during the sitting of parliament, the speaker, by order of the house, and without such order if a vacancy happens by death in the time of a recess for upwards of 20 days) sends his warrant to the clerk of the crown in chancery; who thereupon issues out writs to the sheriff of every county, for the election of all the members to serve for that county, and every city and borough therein. Within three days after the receipt of this writ, the sheriff is to send his precept, under his seal, to the proper returning officers of the cities and boroughs, commanding them to elect their members: and the said returning officers are to proceed to election within eight days from the receipt of the precept, giving four days notice of the same; and to return the persons chosen, together with the precept, to the sheriff.

Nº 111.

But elections of knights of the shire must be proceeded to by the sheriffs themselves in person, at the next county-court that shall happen after the delivery of the writ. The county-court is a court held every month or oftener by the sheriff, intended to try little causes not exceeding the value of 40 s. in what part of the county he pleases to appoint for that purpose: but for the election of knights of the shire, it must be held at the most usual place. If the county-court falls upon the day of delivering the writ, or within six days after, the sheriff may adjourn the court and election to some other convenient time, not longer than 16 days, nor shorter than 10; but he cannot alter the place, without the consent of all the candidates: and, in all such cases, 10 days public notice must be given of the time and place of the election.

And, as it is essential to the very being of parliament that elections should be absolutely free, therefore all undue influences upon the electors are illegal, and strongly prohibited. For Mr Locke ranks it among those breaches of trust in the executive magistrate, which, according to his notions, amount to a dissolution of the government, "if he employs the force, "treasure, and offices of the society to corrupt the "representatives, or openly to pre-engage the electors, "and prescribe what manner of persons shall be chosen: For thus to regulate candidates and electors, "and new-model the ways of election, what is it (says "he) but to cut up the government by the roots and "poison the very fountain of public security?" As soon, therefore, as the time and place of election, either in counties or boroughs, are fixed, all soldiers quartered in the place are to remove, at least one day before the election, to the distance of two miles or more; and not to return till one day after the poll is ended. Riots likewise have been frequently determined to make an election void. By vote also of the house of commons, to whom alone belongs the power of determining contested elections, no lord of parliament, or lord lieutenant of a county, hath any right to interfere in the election of commoners; and, by statute, the lord warden of the cinque-ports shall not recommend any members there. If any officer of the excise, customs, stamps, or certain other branches of the revenue, presumes to intermeddle in elections, by persuading any voter or dissuading him, he forfeits L. 100, and is disabled to hold any office.

Thus are the electors of one branch of the legislature secured from any undue influence from either of the other two, and from all external violence and compulsion. But the greatest danger is that in which themselves co-operate, by the infamous practice of bribery and corruption. To prevent which it is enacted, that no candidate shall, after the date (usually called the *teste*) of the writs, or after the vacancy, give any money or entertainment to his electors, or promise to give any, either to particular persons, or to the place in general, in order to his being elected;

on

(a) 7 Hen. IV. c. 15. 8 Hen. 6. c. 7. 23 Hen. VI. c. 14. 1 W. & M. st. 1. c. 2. 2 W. & M. st. 1. c. 7. 5 & 6 W. & M. c. 20. 7 W. III. c. 4. 7 & 8 W. III. c. 7. and c. 25. 10 & 11 W. III. c. 7. 12 & 13 W. III. c. 10. 6 Ann. c. 23. 9 Ann. c. 5. 10 Ann. c. 19. and c. 33. 2 Geo. II. c. 24. 8 Geo. II. c. 30. 18 Geo. II. c. 18. 19 Geo. II. c. 28. 10 Geo. III. c. 16. 11 Geo. III. c. 42. 14 Geo. III. c. 15.

Election. on pain of being incapable to serve for that place in parliament. And if any money, gift, office, employment, or reward be given, or promised to be given, to any voter, at any time, in order to influence him to give or with-hold his vote, as well he that takes as he that offers such bribe forfeits L. 500, and is for ever disabled from voting and holding any office in any corporation; unless, before conviction, he will discover some other offender of the same kind, and then he is indemnified for his own offence. The first instance that occurs of election bribery, was so early as 13 Eliz. when one Thomas Longe (being a simple man, and of small capacity to serve in parliament) acknowledged that he had given the returning officer and others of the borough for which he was chosen four pounds to be returned member, and was for that premium elected. But for this offence the borough was amerced, the member was removed, and the officer fined and imprisoned. But as this practice hath since taken much deeper and more universal root, it hath occasioned the making of these wholesome statutes; to complete the efficacy of which, there is nothing wanting but resolution and integrity to put them in strict execution.

Undue influence being thus guarded against, the election is to be proceeded to on the day appointed; the sheriff or other returning officer first taking an oath against bribery, and for the due execution of his office. The candidates likewise, if required, must swear to their qualification, and the electors in counties to theirs; and the electors both in counties and boroughs are also compellable to take the oath of abjuration, and that against bribery and corruption. And it might not be amiss, if the members elected were bound to take the latter oath as well as the former; which, in all probability, would be much more effectual than administering it only to the electors.

The election being closed, the returning officer in boroughs returns his precept to the sheriff, with the persons elected by the majority: and the sheriff returns the whole, together with the writ for the county and the knights elected thereupon, to the clerk of the crown in chancery; before the day of meeting, if it be a new parliament, or within 14 days after the election, if it be an occasional vacancy; and this under penalty of L. 500. If the sheriff does not return such knights only as are duly elected, he forfeits, by the old statutes of Henry VI. L. 100; and the returning officer in boroughs, for a like false return, L. 40; and they are besides liable to an action, in which double damages shall be recovered, by the later statutes of king William: and any person bribing the returning officer shall also forfeit L. 300. But the members returned by him are the sitting members, until the house of commons, upon petition, shall adjudge the return to be false and illegal. The form and manner of proceeding upon such petition are now regulated by statute 10 Geo. III. c. 16. (amended by 11 Geo. III. c. 42. and made perpetual by 14 Geo. III. c. 15.), which directs the method of choosing by lot a select committee of 15 members, who are sworn well and truly to try the same, and a true judgment to give, according to the evidence.

ELECTION of Scots Peers. See LORDS.

ELECTION of Ecclesiastical Persons. Elections for the
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dignities of the church ought to be free, according to the stat. 9 Ed. II. cap. 14. If any persons, that have a voice in elections, take any reward for an election in any church, college, school, &c. the election shall be void. And if any persons of such societies resign their places to others for reward, they incur a forfeiture of double the sum; and both the parties are rendered incapable of the place. Stat. 31 Eliz. cap. 6.

ELECTION of a Verderor of the Forest (*electione viridarium foreste*), in law, a writ that lies for the choice of a verderor, where any of the verderors of the forest are dead, or removed from their offices. This writ is directed to the sheriff, and the verderor is to be elected by the freeholders of the county, in the same manner as coroners. New. Nat. Brev. 366.

ELECTION is also the state of a person who is left to his own free will, to take or do either one thing or another, which he pleases. See LIBERTY.

ELECTION, in theology, signifies the choice which God, of his good pleasure, makes of angels or men, for the objects of mercy and grace.

The election of the Jews was the choice God made of that people to be more immediately attached to his worship and service, and for the Messiah to be born of them. And thus particular nations were elected to the participation of the outward blessings of Christianity.

ELECTION also, in the language of some divines, signifies a predestination to grace and glory, and sometimes to glory only. And it has been enjoined as an article of faith, that predestination to grace is gratuitous, merely and simply so; *gratia, quia gratis data*. But the divines are much divided as to the point, whether election to glory be gratuitous, or whether it supposes obedience and good works, *i. e.* whether it be before or after the provision of our obedience. See GRACE, and REPROBATION.

ELECTIVE, something that is done, or passes, by election. See ELECTOR.

Some benefices are elective, others collative. Municipal offices in England are generally elective; in Spain, venal. Poland is an elective kingdom.

ELECTIVE Attraction. See CHEMISTRY-Index.

ELECTOR, a person who has a right to elect or choose another to an office, honour, &c. See ELECTION.

Electors are particularly, and by way of eminence, applied to those princes of Germany in whom lies the right of electing the emperor; being all sovereign princes, and the principal members of the empire.

The electoral college, consisting of all the electors of the empire, is the most illustrious and august body in Europe. Bellarmine and Baronius attribute the institution of it to pope Gregory V. and the emperor Otto III. in the tenth century; of which opinion are the generality of historians, and particularly the canonists: however, the number of electors was unsettled, at least, till the 13th century. In 1356 Charles IV. by the golden bull, fixed the number of electors to seven; three ecclesiastics, *viz.* the archbishops of Mentz, Treves, and Cologne; and four seculars, *viz.* the king of Bohemia, count Palatine of the Rhine, duke of Saxony, and marquis of Brandenburg. In 1648 this order was changed, the duke of Bavaria being put in the place of the count Palatine, who having accepted the crown of Bohemia was outlawed by the emperor;

Elect. but being at length restored, an eight electorate was erected for the duke of Bavaria. In 1692, a ninth electorate was created, by the emperor Leopold, in favour of the duke of Hanover, of the house of Brunswic Lunenburg.

There is this difference between the secular and ecclesiastical electors, that the first have an active and passive voice, that is, may choose and be chosen; the last, an active only. The three archbishops are to be 30 years old, before they can be advanced to the dignity; the seculars, 18, before they can perform the office themselves. These last have each their vicars, who officiate in their absence.

Besides the power of choosing an emperor, the electors have also that of capitulating with and deposing him; so that, if there be one suffrage wanting, a protest may be entered against the proceedings. By the right of capitulation, they attribute to themselves great privileges, as making of war, coining, and taking care of the public interest and security of the states; and the emperor promises, upon oath, to receive the empire upon these conditions.

The electors have precedence of all other princes of the empire, even of cardinals and kings; and are addressed under the title of *electoral highness*.

Their several functions are as follow. The elector of

Mentz is chancellor of Germany, convokes the states, and gives his vote before any of the rest. The elector of Cologne is grand chancellor of Italy, and consecrates the emperor. The elector of Treves is chancellor of the Gauls, and confers imposition of hands upon the emperor. The count Palatine of the Rhine is great treasurer of the empire, and presents the emperor with a globe at his coronation. The elector of Bavaria is great master of the imperial palace, and carries the golden apple. The marquis of Brandenburg is grand chamberlain, and puts the ring on the emperor's finger. The elector of Saxony is grand marshal, and gives the sword to the emperor. The king of Bohemia is grand butler, and puts Charlemagne's crown on the emperor's head. Lastly, the elector of Hanover, now king of Great Britain, is arch-treasurer, tho' first erected under the title of *standard-bearer* of the empire.

ELECTORATE, a term used as well to signify the dignity of, as the territories belonging to, any of the electors of Germany; such are Bavaria, Saxony, &c. See **ELECTOR**.

ELECTRIC, derived from *ηλεκτρον*, "amber," in physics, is a term applied to those substances, in which the electric fluid is capable of being excited, and accumulated without transmitting it, and therefore called *non-conductors*. See **ELECTRICITY**.

E L E C T R I C I T Y,

IN general, signifies the operations of a very subtle fluid, in most cases invisible, but which sometimes becomes the object of our sight and other senses, discovering itself to be one of the chief agents employed in producing the phenomena of nature.

SECT. I. Definitions of Terms used in the Science.

BEFORE we can enter upon this science with propriety, even so far as to give an history of its rise and progress, it seems necessary to give some explanation of the terms made use of by writers on electricity, that the reader may not be embarrassed with words whose meaning he cannot perhaps easily comprehend.

1. The foundation of all that is known upon this subject, is the difference between electric bodies and such as are not. The former may generally be distinguished by their attracting and repelling light substances, which the latter cannot be made to do. The principal electric bodies are glass, amber, sealing-wax, gum-lac, sulphur, rosin, &c. They are often called *non-conductors*, or *electrics per se*.

2. The usual way in which the electric power of any body can be discovered, is by rubbing it with some soft substance, generally woollen, silk, or fur; and, according to the strength of the electric virtue, the former body will attract and repel light substances presented to it at a greater or less distance. If the virtue is very strong, the electric body will emit sparks, or even strong flashes of fire, to a considerable distance. In some cases electricity discovers itself by heating the body, or blowing air upon it; but in both these ways it is much weaker than that produced by rubbing. In

whatever way this power is made to show itself, the substance possessed of it is said to be *excited*.

3. *Conductors*, called also *non-electrics*, are such substances as, though incapable of being excited, can yet in certain circumstances convey the electric power from one body to another, and that to any imaginable distance. The best conductors are metals of all kinds, charcoal, and water.

4. *Electrics*, we have already observed, are also called *non-conductors*; and this name they have from their power of stopping the communication of the electric virtue from one body to another. Thus, though any conductor be placed properly for receiving the virtue from an excited electric, none will pass to it if any electric substance be interposed; or, if the conductor be terminated by an electric, none will pass beyond the place where the electric substance begins.

5. *Insulation* is when a conducting substance is placed upon an electric, so that any power communicated to it cannot pass off. It must be remembered, however, that all this is to be understood with some degree of limitation; for there is no substance either a perfect electric, or a perfect conductor; the best conductors making a sensible resistance to the passage of the fluid through them when they are very long; and the most perfect electrics transmitting some of the fluid over, or through them. Indeed, though these two different kinds of substances seem to be so far removed from one another, they in reality approach to a surprising degree, inasmuch that there are many substances which can be excited as electrics, and yet have a very considerable conducting power.

6. The effects of the electric fluid discovering themselves

^{History} selves either by attraction and repulsion, or by emitting streams, or pencils as they are called, of blue light, are all classed under the general word *electricity*; and any body to which that power of attraction and repulsion, &c. is communicated, is said to be *electrified*. If its virtue is inherent in itself, it is said to be *excited*.

7. Electricity is found to be of two kinds; the one called *negative*, and the other *positive*. It is uncertain in what the difference betwixt these two consists. Dr Franklin is of opinion that the former consists in a superabundance of the fluid, or when more is thrown upon any substance than it can conveniently contain; the other, when a part of it is abstracted, and the body contains less than it naturally ought to do. Other theorists suppose, that when the fluid is directed outwards from any substance, that substance will in all cases be electrified positively; and that when the fluid is either entering or has a tendency to enter into any substance, it will then be electrified negatively. This question will be discussed in the course of the treatise.—The most remarkable differences we can perceive between the positive and negative electricities are that they attract each other, though strongly repulsive of themselves; that is, two bodies positively electrified, or negatively electrified, repel each other; but one body positively electrified will attract another negatively so; and if the electricities are very strong, a spark will be observed between them at meeting. These electricities are produced naturally by exciting different substances, or by using a different rubber to the same substance. Thus, glass usually produces the positive electricity; but by using a certain kind of rubber, or altering the smoothness of its surface, it may be made to produce the negative kind. The two electricities are sometimes called the *vitreous* and *resinous*, as well as positive and negative.

SECT. II. History of Electricity.

^{Electricity when first mentioned.} THOUGH it is certain that, ever since the creation of the world, the fluid we speak of hath had the same share in all the natural operations that it hath just now; yet the discovery of its action, and even of its existence, is, comparatively speaking, of a very late date. Thales the Milesian, who lived about 600 years before Christ, was the first that observed the electrical properties of amber. Of these, indeed, he knew no more than that this substance would attract light bodies when it was rubbed. For 300 years after his time, we hear nothing farther concerning this subject. Theophrastus then tells us, that the *lyncurium* (the same substance now called the *tourmalin*), has the property of attracting light bodies, as well as amber. From this time, there is a chasm in the history of electricity for no less than 1900 years. Indeed, it is scarce to be supposed that during this long interval any person applied himself to the investigation of the subject; as, for the greatest part of it, science of every kind was almost totally extinguished. The electrical properties of jet, however, and, according to Mr Bose, of the agate, were some way or other discovered during the abovementioned period. But it was not till the beginning of the 17th century, that the subject of electricity became properly a distinct science, and the foun-

dation was laid of those discoveries which have since taken place. ^{History.}

The first who can properly be called an *electrician*, was Dr William Gilbert, who, in the year 1600, wrote a book *de Magnete*, which contains a variety of electrical experiments. All these, however, considered only the attractive property of certain substances, which, from their agreement in this respect with amber (in Latin *electrum*), were called *electric*. Dr Gilbert's merit consists in his having been at great pains to find out a number of such substances, and thus considerably enlarging the number of electrics. ² Discoveries of Dr Gilbert.

Till the year 1670, it doth not appear that any farther discoveries were made; except some trifling additions to the catalogue of electrics. About this time, Mr Boyle applied himself to the study of electricity. He enlarged the catalogue of electrics; and found that their electric properties were increased by wiping and warming them before they were rubbed. He observed also, that all kinds of bodies were attracted promiscuously; and imagined that they were attracted *in vacuo* as well as in air. This last position, however, is denied by Mr Beccaria; and we shall afterwards show that Mr Boyle must necessarily have been mistaken. He also observed the electric light, though only in the instance of some diamonds.

Otto Guericke, however, who was cotemporary with Mr Boyle, improved the science much farther. He made use of a sulphur globe, whirled on an axis much in the same way with our present glass globes. Thus he could excite a vastly greater power of electricity than any of his predecessors, and try all their experiments to much more advantage. He discovered electric repulsion; and not only saw the electric light more clearly than Mr Boyle, but heard the hissing sound with which it is emitted. He also made another remarkable discovery, but which has since been very generally overlooked; namely, that a feather, when repelled by an excited electric, always keeps the same face towards the body which repels it, as the moon does to the earth. ³ Discoveries of Otto Guericke and Sir Isaac Newton.

The next discovery of any moment was made by Sir Isaac Newton; who observed, that the electric attraction and repulsion penetrated through glass; and it is much to be regretted that this accurate philosopher did not apply himself to the study of electricity with greater assiduity.

In 1709, a treatise was written on electricity by Mr Hauksbee; who not only far excelled all his predecessors and cotemporaries, but also made some discoveries which well deserve the attention of the most expert electricians at this day. Besides a variety of new experiments made upon electric attraction and repulsion, as well as the light emitted by electric bodies; he found a method of rendering opaque bodies transparent by means of electricity. He lined more than half the inside of a glass globe with sealing-wax; and having exhausted the globe, he put it in motion; when applying his hand to excite it, he saw the shape and figure of all the parts of his hand distinctly and perfectly, on the concave superficies of the wax within, just as if only pure glass without any wax at all had been interposed between his eye and his hand. The lining of wax, where it was spread the thinnest, would ⁴ Remarkable discovery by Mr Hauksbee.

History. but just allow the light of a candle through it in the dark; but in some places the wax was at least an eighth part of an inch thick. Yet, even in these places, the light and figure of his hand were as distinguishable through it as any where else. The sealing-wax did not adhere to the glass in all places; but this made no difference with regard to the transparency. Pitch answered the purpose equally well with sealing-wax.

M. Hauksbee also made a farther improvement, by using a glass globe, which acts much more powerfully than a sulphur one. After his death, however, not only the use of glass globes, but even the study of electricity itself, seems to have been pretty generally laid aside for some time. The reason of this was, that the recent discoveries of Sir Isaac Newton engrossed the attention of philosophers to such a degree, that they had no leisure for any thing else. After the death of that great man, however, the science of electricity began to revive; and, in 1729, a capital discovery was made by Mr Stephen Grey. This was the distinction between conductors and non-conductors of electricity. As the discovery was entirely accidental, and attended with several curious circumstances, we shall here give some account of it. In the month of February 1729, Mr Grey, after some fruitless attempts to excite an electric power in metals, recollected a suspicion he had for some time entertained, that as a glass tube, when excited in the dark, communicated its light to various bodies, it might at the same time possibly communicate to them an electricity; that is, a power of attracting light bodies; which, as yet, was all that was understood by the word *electricity*. For this purpose he provided himself with a glass tube, three feet five inches long, and near one inch and two-tenths in diameter. To each end was fitted a cork; to keep the dust out when the tube was not in use. His first experiments were made with a view to determine whether the tube would attract equally well with the ends shut as with them open. In this respect there was no difference; but he found that the corks attracted and repelled light substances as well, and rather better, than the tube itself. He then fixed an ivory ball upon a stalk of fir about four inches long, and thrusting the end of the stalk into one of the corks, he found the ball endowed with a strong attractive and repulsive virtue. This experiment he repeated in many different ways; fixing the ball upon long sticks, and upon pieces of brass and iron wire, always with the same success; but he constantly observed, that the ball at the end attracted more vigorously than that part of the wire nearest the tube.

The inconvenience of using long wires in this manner, put Mr Grey upon trying whether the ball might be suspended by a pack-thread with a loop on the tube, with equal success; and the event fully answered his expectation. Having thus suspended bodies of the greatest length he conveniently could, to his tube, he ascended a balcony 26 feet high, and fastening a string to his tube, found that the ball would attract light bodies on the ground below. This experiment succeeded in the greatest heights to which he could ascend; after which, he attempted to carry the electricity horizontally. His first attempt miscarried, because he suspended his line, which was intended to carry the electricity horizontally, by a pack-thread; and thus the

fluid got off from it: but though Mr Grey knew this *History.* was the case, he could not at any time think of any method to prevent it.

On the 30th of June 1729, Mr Grey paid a visit to Mr Wheeler, in order to give him a specimen of his experiments; but told him of the unsuccessful attempt he had made to carry the electric fluid horizontally. Mr Wheeler proposed to suspend the conducting line by *silk* instead of *pack-thread*. For this advice he could give no reason, but that the silk thread was *smaller* than the other: however, with it they succeeded perfectly well. Their first experiment was in a matted gallery at Mr Wheeler's house, on the 2d of July 1729. About four feet from the end of the gallery they fastened a line across the place. The middle of this line was silk, the rest pack-thread. Over the silken part they laid one end of the conducting line, to which was fastened the ivory ball, and which hung down about nine feet below the line stretched across the gallery. The conducting line was 80½ feet in length, and the other end of it was fastened by a loop to the electric tube. Upon rubbing the tube, the ivory ball attracted and repelled light substances as the tube itself would have done. They next contrived to return the line, so that the whole length of it amounted to 147 feet; which also answered pretty well. But, suspecting that the attraction would be stronger without doubling or returning the line, they made use of one carried straight forward for 124 feet; and, as they expected, found the attraction in this manner stronger than when the line had been doubled. Thus they proceeded with their experiments; still adding more conducting line, till at last their silk-string broke with the weight. This they endeavoured to supply, first with a small iron-wire, and then with a brass one. The result of these experiments, however, soon convinced them that the silk refused to conduct the electric fluid, not on account of its *smallness*, as they had supposed, but on account of some difference in the matter. The wires were smaller than the silk-thread, yet the electricity was effectually carried off by them. They had recourse, therefore, to thicker lines of silk; and thus conveyed the electric matter to the distance of 765 feet; nor did they perceive the virtue to be at all diminished by the distance to which it was carried.

This discovery of the non-conducting power of silk was quickly followed by a discovery of the same power in many other substances: and thus, in fact, the foundation of almost all the subsequent improvements in electricity was laid; though in the sciences, as well as in most others, few discoveries have been made by reasoning, but many by accident. Mr Grey continued to study electricity as long as he lived; and has given a set of experiments, of which Dr Priestley says, "It is not easy to know what to make of them." He imagined that he had discovered in all electric substances a *perpetual attractive power*, which required no kind of excitation either by heating, rubbing, or any kind of attrition. He took 19 different substances, which were either rosin, gum-lac, shell-lac, bees-wax, sulphur, pitch, or two or three of these differently compounded. These he melted in a spherical iron ladle; except the sulphur, which was best done in a glass vessel. When these were taken out of the ladle, and their spherical surface hardened, he says they would

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History. would not attract till the heat was abated, or till they came to a certain degree of warmth; that there was then a small attraction, which increased till the substance was cold, when it was very considerable. The manner in which he kept these substances in a state of attraction was, by wrapping them in any thing which would preserve them from the external air. At first, for the smaller bodies he used white paper, and for the larger ones white flannel; but afterwards, he found that black worsted stockings would do as well. When thus wrapped up, they were put into a large firm box, where they remained till he had occasion to use them. Thus prepared, they retained their attractive virtue for four months. These experiments are similar to some others lately made and published as new discoveries.

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planetary
motions.

Some other experiments were made by Mr Grey, with regard to the attraction of electric bodies *in vacuo*; and in this he determined with Mr Boyle against the opinion of Mr Beccaria above mentioned. But the most remarkable experiments mentioned by Mr Grey, are his imitations of the planetary motions. "I have lately made (says he) several new experiments upon the projectile and pendulous motions of small bodies by electricity; by which small bodies may be made to move about large ones, either in circles or ellipses; and those either concentric or eccentric to the centre of the large body about which they move, so as to make many revolutions about them. And this motion will constantly be the same way that the planets move about the sun, viz. from the right hand to the left, or from west to east. But these little planets, if I may so call them, move much faster in their apogee than in the perigee parts of their orbits; which is directly contrary to the motion of the planets about the sun." The manner in which these experiments were made, as delivered by him on his death-bed to Dr Mortimer, was as follows: "Place a small iron globe (said he), of an inch or an inch and an half in diameter, on the middle of a circular cake of rosin, seven or eight inches in diameter, gently excited; and then a light body suspended by a very fine thread, five or six inches long, held in the hand over the centre of the cake, will, of itself, begin to move in a circle round the iron globe, and constantly from west to east. If the globe is placed at any distance from the centre of the circular cake, it will describe an ellipse, which will have the same eccentricity as the distance of the globe from the centre of the cake. If the cake of rosin be of an elliptical form, and the iron globe be placed in the centre of it, the light body will describe an elliptical orbit of the same eccentricity with the form of the cake. If the globe be placed in or near one of the foci of the elliptical cake, the light body will move much swifter in the apogee than in the perigee of its orbit. If the iron globe is fixed on a pedestal an inch from the table, and a glass hoop, or a portion of a hollow glass cylinder excited, be placed round it, the light body will move as in the circumstances mentioned above, and with the same varieties." He said, moreover, that the light body would make the same revolutions, only smaller, round the iron globe placed on the bare table, without any electrical body to support it: but he acknowledged that he had not found the experiment succeed if the thread was supported by any thing but a human

3.

hand, though he imagined any other animal substance would have answered the purpose.

These experiments occasioned a great deal of speculation. Dr Mortimer was the only person who was able to repeat them with success, and he only when nobody but himself was present. It was therefore generally supposed that both he and Mr Grey had been deceived; but from some experiments to be related hereafter, it seems probable that the success of Mr Grey and Dr Mortimer was owing to their having performed their experiments with candle-light; and the failure of the others, to their having attempted them by day-light. Notwithstanding which, it is more than probable that Mr Grey has been deceived in a number of particulars; for no motion can be performed by an artificial excitation of the electric fluid, but what is attended with much irregularity.

Soon after Mr Grey's discovery of the difference between conductors and non-conductors of electricity, Mr Du Fay discovered the difference between positive and negative, or, as they were for some time called, by Mr Du Fay, the *vitreous* and *resinous* electricities. This discovery was quite accidental. It was made in consequence of his casually observing, that a piece of leaf-gold, repelled by an excited glass tube, and which he meant to chase about the room with a piece of excited gum copal, instead of being repelled by it as it was by the glass tube, it was eagerly attracted. The same was the case with sealing-wax, sulphur, rosin, and a number of other substances. He discovered also, that it was impossible to excite a tube in which the air was condensed.

In the year 1742, the use of glass globes was again introduced by Mr Bose, professor of philosophy at Wittenburgh; though some attribute this to Christian Augustus Hansen, professor of mathematics at Leipzig. He added also a prime conductor, which consisted of a tube of iron or tin. It was at first supported by a man standing upon cakes of rosin; but afterwards suspended by silk lines horizontally before the globe. A bundle of thread was put into the end next to the globe, which not only prevented any injury to the glass, but rendered the electricity stronger.

The most remarkable discovery that hath yet been made in the science of electricity, was in the end of the year 1745, and beginning of 1746. This was the method of giving the electric shock, or the accumulation of the power of electricity in a vial. This had its name of the *Leyden vial*, from Mr Cunæus, a native of Lyden, who exhibited it as he was repeating some experiments made by Messrs Muschenbroek and Allamand, professors in the university of that city. He was not, however, the inventor. The merit of this discovery (if any merit can arise from a discovery made by accident) belongs to Mr Van Kleist, dean of the cathedral at Camin. On the 4th of November 1745, he sent the following account of it to Dr Leiberkuhn at Berlin: "When a nail, or a piece of thick brass wire, &c. is put into a small apothecary's vial, and electrified, remarkable effects follow: but the vial must be very dry, or warm. I commonly rub it over before-hand with a finger, on which I put some powdered chalk. If a little mercury or a few drops of spirit of wine are put into it, the experiment succeeds the better. As soon as this phial and nail are removed from the

History.

8.
Vitreous
and resinous
electricity
discovered
by Mr Du
Fay.

9.
Electrical
shock dis-
covered.

History.

the electrifying glass, or the prime conductor to which it hath been exposed is taken away, it throws out a pencil of flame so long, that with this burning machine in my hand, I have taken above 60 steps in walking about my room. When it is electrified strongly, I can take it into another room, and there fire spirits of wine with it. If while it is electrifying, I put my finger, or a piece of gold which I hold in my hand, to the nail, I receive a shock which stuns my arms and shoulders.

"A tin tube, or a man placed upon electrics, is electrified much stronger by this means than in the common way. When I present this vial and nail to a tin tube, which I have 15 feet long, nothing but experience can make a person believe how strongly it is electrified. Two thin glasses have been broken by the shock of it."

Soon after this, a method of giving the shock was discovered in Holland by Mr Cunæus, in the following manner: M. Muschenbroek and his friends, observing that electrified bodies exposed to the common atmosphere, which is always replete with conducting particles of various kinds, soon lost their electricity, and were capable of retaining but a small quantity of it; imagined, that, were the electrified bodies terminated on all sides by original electrics, they might be capable of receiving a stronger power and retaining it for a longer time. Glass being the most convenient electric for this purpose, and water the most convenient non-electric, they first made these experiments with water in glass bottles: but no considerable discovery was made, till Mr Cunæus, happening to hold his glass vessel in one hand, and endeavouring to disengage it from the conductor with the other (when he imagined the water had received as much electricity as the machine could give it), was surprised with a sudden shock in his arms and breast, which he had not in the least expected.

TO
Behaviour
of different
philosophers
on
this occa-
sion.

The discovery of such a terrible effect of the electric power immediately raised the attention of all the philosophers in Europe. Many of them greatly exaggerated their accounts; either from a natural timidity, or their love of the marvellous. Mr Muschenbroek, who tried the experiment with a very thin glass bowl, told Mr Reaumur in a letter wrote soon after the experiment, That he felt himself struck in his arms, shoulder, and breast, so that he lost his breath; and was two days before he recovered from the effects of the blow and the terror. He added, that he would not take a second shock for the whole kingdom of France. Mr Allamand, who made the experiment, with a common beer-glass, said, that he lost his breath for some moments; and then felt such an intense pain all along his right arm, that he was apprehensive of bad consequences, but it soon after went off without any inconvenience, &c. Other philosophers, on the contrary, showed their heroism and magnanimity, by receiving a number of electric shocks as strong as they could possibly make them. Mr Bose above mentioned, wished that he might die by the electric shock, in order to furnish, by his death, an article for the memoirs of the academy of sciences at Paris. "But (adds Dr Priestley, from whom this account is taken), it is not given to every electrician to die in so glorious a manner as the justly envied Richman."

From the time of this discovery, electricity became

the general subject of conversation. A great number of people all over Europe got their livelihood by going about and showing the phenomena of it; and, at the same time, the passion for the marvellous strongly discovered itself in some effects of electricity, pretended to be found out in Italy and Germany. It was asserted by Signior Pivati at Venice, and after him by Verati at Bologna, Mr Bianchi at Turin, and Mr Winckler at Leipsic, that if odoriferous substances were confined in glass vessels, and the vessels excited, the odours and other medicinal virtues would transpire through the glass, infect the atmosphere of the conductor, and communicate the virtue to all persons in contact with it; also, that those substances, held in the hands of persons electrified, would communicate their virtues to them; so that the medicines might be made to operate without being taken into the stomach. They even pretended to have wrought many cures by the help of electricity applied in this way. To see the wonderful effects of these *medicated tubes*, as they were called, Mr Nollet travelled into Italy, where he visited all the gentlemen who had published any account of these experiments. But tho' he engaged them to repeat their experiments in his presence, and upon himself; and though he made it his business to get all the information he could concerning them; he returned fully convinced, that in no instance had odours been found to transpire through the pores of excited glass, and that no drugs had ever communicated their virtues to people who had only held them in their hands while they were electrified. He was convinced, however, that by continued electrification without drugs, several persons had found considerable relief in various disorders; particularly, that a paralytic person had been cured at Geneva, and that one who was deaf of an ear, another who had a violent pain in his head, and a woman with a disorder in her eyes, had been cured at Bologna; so that from this time we may date the introduction of electricity into the medicinal art. See MEDICINE-Index.

History.

II
Incredible
powers at-
tributed to
electricity

Another wonderful experiment was the *beatification* of Mr Boze; which other electricians, for a long time, endeavoured to repeat after him but to no purpose. His description of this remarkable experiment was, that if, in electrifying, large globes were employed, and the electrified person stood upon large cakes of pitch, a lambent flame would by degrees arise from the pitch, and spread itself around his feet; that from thence it would be propagated to his knees and body, till at last it ascended to his head; that then, by continuing the electrification, the person's head would be surrounded by a glory such as is in some measure represented by painters in their ornamenting the heads of saints. Dr Watson took the utmost pains to repeat this experiment. He underwent the operation several times, and was supported during the time of it by solid electrics three feet high. Being electrified very strongly, he felt a kind of tingling on the skin of his head and in many other parts of his body. The sensation resembled what would arise from a vast number of insects crawling over him at the same time. He constantly observed the sensation to be the greatest in those parts of his body which were nearest to any non-electric; but no light appeared upon his head, though the experiment was several times made in the dark, and with some continuance. At last the Doc-

tor

History.

History.

tor wrote to Mr Boze himself, and his answer showed that the whole had been a trick. Mr Boze acknowledged that he had made use of a suit of armour, which was decked with many bullions of steel, some pointed like nails, others like wedges, and some pyramidal; and that when the electrification was very vigorous, the edges of the helmet would dart forth rays something like those which are painted on the heads of saints.

a pretty loud clap of thunder. Immediately he ran to the machine, taking with him a phial furnished with a brass wire; and presenting the wire to the end of the rod, a small spark issued from it with a snap like that which attends a spark from an electrified conductor. Stronger sparks were afterwards drawn in the presence of the curate and a number of other people. The curate's account of them was, that they were of a blue colour, an inch and an half in length, and smelled strongly of sulphur. In making them, he received a stroke on his arm a little below the elbow; but he could not tell whether it came from the brass wire inserted into the phial, or from the bar. He did not attend to it at the time; but the pain continuing, he uncovered his arm when he went home in the presence of Coiffier. A mark was perceived round it, such as might have been made by a blow with the wire on his naked skin.

12
Identity of electric fluid with lightning suspected by Dr Franklin.

The identity of the electrical matter with lightning is a discovery that hath been of more practical use to mankind than any other. From almost the first discovery of the electric light, and the crackling with which it is emitted, a similarity between it and the phenomena of thunder and lightning had been observed. This is taken notice of by Dr Wall, one of the first who viewed the electric light in any perfect manner. The Abbé Nollet, Mr Winckler, and others, also enumerated many resemblances between the phenomena of electricity and those of thunder; but they did not think of any method by which their suspicions could be brought to the test of experience. This was first proposed by Dr Franklin in 1750. He had before discovered the effects of pointed bodies in drawing off the electric matter more powerfully than others. This was suggested to him by one Mr Thomas Hopkinson, who electrified an iron ball of three or four inches diameter with a needle fastened to it, expecting to draw a stronger spark from the point of it; but was surprised to find little or none. Dr Franklin, improving on this hint, supposed that pointed rods of iron, fixed in the air when the atmosphere was loaded with lightning, might draw from it the matter of the thunder-bolt, without noise or danger, into the body of the earth. His account of this supposition is given by himself in the following words. "The electric fluid is attracted by points. We do not know whether this property be in lightning; but since they agree in all the particulars in which we can already compare them, it is not improbable, that they agree likewise in this; let the experiment be made."

About a month after this, Dr Franklin himself had an opportunity of verifying his own hypothesis. He was waiting for the erection of a spire in the city of Philadelphia, not imagining that a pointed rod of a moderate height could answer the purpose. At last it occurred to him, that by means of a common kite he could have a readier access to the higher regions of the atmosphere than any other way whatever. Preparing, therefore, a large silk handkerchief and two cross sticks of a proper length on which to extend it, he took the opportunity of the first approaching thunder-storm to take a walk into a field where there was a shed convenient for his purpose. But dreading the ridicule which too commonly attends unsuccessful attempts in science, he communicated his intention to nobody but his son, who assisted him in raising the kite. A considerable time elapsed before there was any appearance of success. One very promising cloud had passed over the kite without any effect; when, just as he was beginning to despair, he observed some loose threads of the hempen string to stand erect and avoid one another, just as if they had been suspended by the conductor of a common electrical machine. On this he presented his knuckle to a key which was fastened to the string, and thus obtained a very evident electric spark. Others succeeded even before the string was wet; but when the rain had begun to descend, he collected electric fire pretty copiously. He had afterwards an insulated iron rod to draw the lightning into his house; and performed almost every experiment with real lightning that had before been done with the artificial representations of it by electrical machines.

13
His suspicion verified.

This suspicion of Dr Franklin's was verified in 1752, and the discovery is perhaps the only one in the whole science that hath not been the result of accident. The most active persons were two French gentlemen, Messrs Dalibard and Delor. The former prepared his apparatus at Marly la Ville, situated five or six leagues from Paris; the other at his own house, on some of the highest ground in that capital. Mr Dalibard's machine consisted of an iron rod 40 feet long, the lower extremity of which was brought into a centry-box, where the rain could not come; while on the outside it was fastened to three wooden posts by long silken strings defended from the rain. This machine happened to be the first that was favoured with a visit of the etherial fire. Mr Dalibard himself was not at home; but, in his absence, he had entrusted the care of his apparatus to one Coiffier a joiner, who had served 14 years among the dragoons, and on whose courage and understanding he could depend. This artisan had all the necessary instructions given him; and was desired to call some of his neighbours, particularly the curate of the parish, whenever there should be any appearance of a thunder storm. At length the long expected event arrived. On Wednesday the 10th of May 1752, between two and three in the afternoon, Coiffier heard

14
Thus a new field was opened for philosophers; but it was soon found, that experiments of this kind were not always to be made without danger. This very year, 1752, the Abbe Nollet published some cautions to those who tried experiments on lightning. He had been informed by letters from Florence and Bologna, that some people there had received violent shocks while they drew sparks from an iron bar electrified by thunder. One of his correspondents informed him, that once, as he was endeavouring to fasten a small chain with a copper ball at one of its extremities to a great chain which communicated with the bar at the top of the building, there came a flash of lightning, which he did not see, but which affected the chain with a noise like that of wild-fire. The observer instantly

Danger of making experiments with lightning.

History.

15
Professor
Richman
killed by
lightning.

stantly received such a shock, that the ball fell out of his hands, and he was struck backwards four or five paces.

The greatest instance of the danger of these experiments, however, was the death of Mr Richman professor at Petersburg above-mentioned. This happened on the 6th of August 1753, as he was making experiments on lightning drawn into his own room. He had provided himself with an instrument for measuring the quantity of electricity communicated to his apparatus; and as he stood with his head inclined to it, Mr Solokow an engraver, who was near him, observed a globe of blue fire, as big as his fist, jump from the instrument, which was about a foot distant, to Mr Richman's head. The professor was instantly dead, and Mr Solokow was also much hurt. The latter, however, could give no particular account of the way in which he was affected; for, at the time the professor was struck, there arose a sort of steam or vapour, which entirely benumbed him, and made him sink down to the ground, so that he could not even remember to have heard the clap of thunder, which was a very loud one. The globe of fire was attended with an explosion like that of a pistol; the instrument for measuring the electricity (called by the professor an *electrical gnomon*), was broken to pieces, and the fragments thrown about the room. Upon examining the effects of the lightning in the professor's chamber, they found the door-case half split through, and the door torn off and thrown into the room. They opened a vein in the body twice, but no blood followed; after which, they endeavoured to recover life by violent friction, but in vain: upon turning the corpse with the face downwards during the rubbing, an inconsiderable quantity of blood ran out of the mouth. There appeared a red spot on the forehead, from which spirted some drops of blood through the pores, without wounding the skin. The shoe belonging to the left foot was burst open, and uncovering the foot at that part, they found a blue mark; from whence it was concluded, that the electric matter having entered at the head, made its way out again at that foot. Upon the body, particularly on the left side, were several red and blue spots resembling leather shrunk by being burnt. Many more also became visible over the whole body, and particularly over the back. That upon the forehead changed to a brownish red, but the hair of the head was not singed. In the place where the shoe was unripped, the stocking was entire; as was the coat every where, the waistcoat only being singed on the foreflap where it joined the hinder: but there appeared on the back of Mr Solokow's coat long narrow streaks, as if red-hot wires had burned off the nap, and which could not well be accounted for.

When the professor's body was opened next day, the cranium was very entire, having neither fissure nor contra-fissure: the brain was found; but the transparent pellicles of the wind-pipe were excessively tender, and easily rent. There was some extravasated blood in it, as also in the cavities below the lungs. Those of the breast were quite sound; but those towards the back of a brownish black colour, and filled with more of the blood above mentioned. The throat, the glands, and the small intestines, were all inflamed. The singed leather-coloured spots penetrated the skin only. In 48

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hours the body was so much corrupted that they could scarce get it into a coffin.

Since the discovery of the identity of lightning and the electric matter, long rods of iron or other metal have been made use of with a view to protect buildings from the danger of strokes of lightning. A considerable dispute has been carried on whether these rods ought to be pointed or not; but a committee of the royal society have very lately determined it in favour of the former.

For some time, the science of electricity seems to have been at a stand. Numberless improvements indeed have been made upon what was before discovered, but scarce any thing new hath been added. The only thing which can properly be reckoned a new discovery is that of the *electrophorus* by Signior Volta an Italian; which on many accounts may be reckoned the most surprising machine hitherto invented.

SECT. III. *Of the Apparatus necessary for exciting Electricity, and communicating it to other Bodies, &c.*

THE instruments most in use for this purpose are those called *electrical machines*, of which there have been so many different forms, that it would be tedious and difficult to give only a very short description of them all. We shall therefore first lay down the most necessary rules for constructing electrical machines in general; and then give a particular description of those machines which are most generally useful, and contain all the improvements hitherto made.

§ 1. *Of the Construction of Electrical Machines.*

THE principal parts of the machine are the electric, the moving engine, and the prime conductor, *i. e.* an insulated conductor, which immediately receives the electricity from the excited electric.

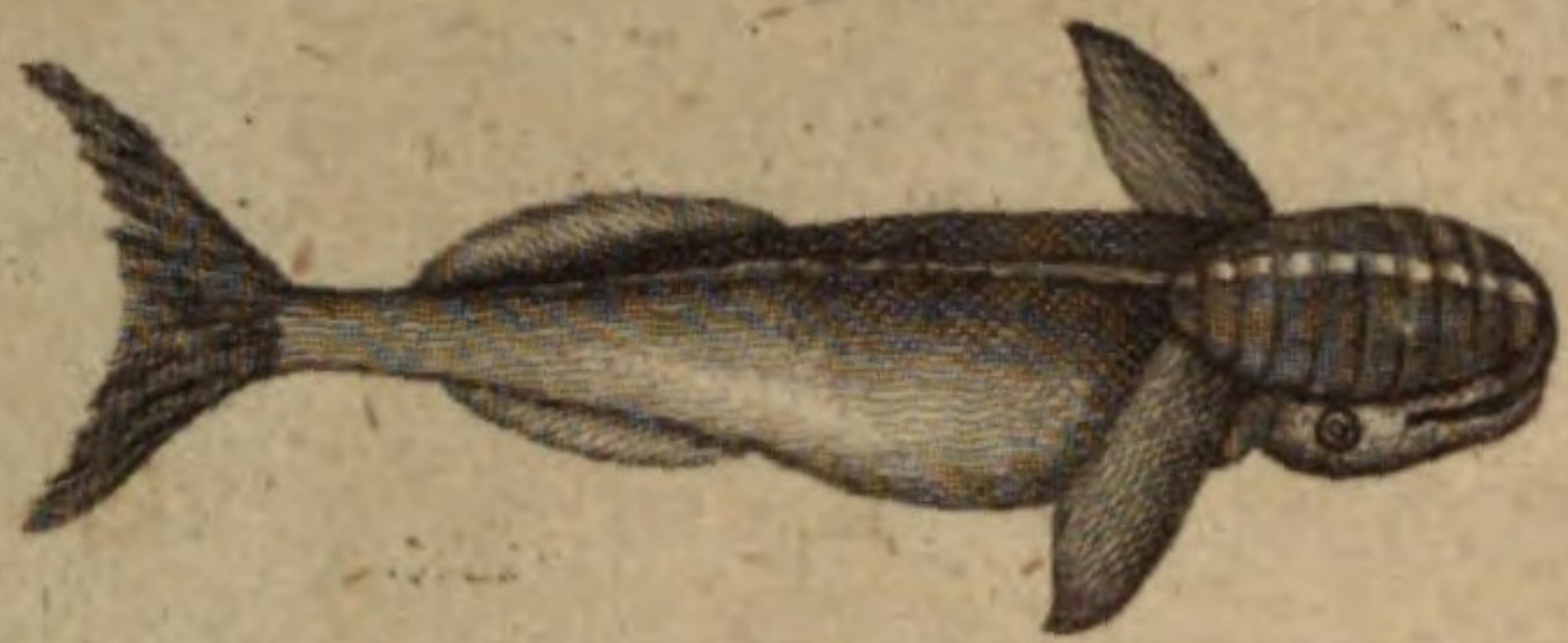
Formerly, different kinds of electrics were used, as glass, rosin, sulphur, sealing-wax, &c. Their forms were also various, as globes, cylinders, spheroids, &c. The reason of this variety was, in the first place, that it was not then ascertained what substance acted most powerfully; and secondly, in order to produce a positive or negative electricity at pleasure. At present smooth glass only is used; for when the machine has an insulated rubber, the operator may produce positive or negative electricity at his pleasure, without changing the electric. In regard to the form of the glass, those commonly used at present are globes and cylinders. The most convenient size for a globe, is from nine to twelve inches diameter. They are made with one neck, which is cemented to a strong brass cap in order to adapt them to a proper frame. The best cement for electrical purposes is made with two parts of rosin, two of bees-wax, and one of the powder of red ochre. These ingredients are melted, and mixed together in any vessel over the fire; and afterwards kept for use. This kind of cement sticks very fast; and is much preferable to rosin only, as it is not so brittle, and at the same time insulates equally well. The cylinders are made with two necks; they are used to the greatest advantage without any axis; and their common size is from four inches diameter and eight inches long, to twelve

16
Apparatus.
Conductors
used for
preserving
houses.

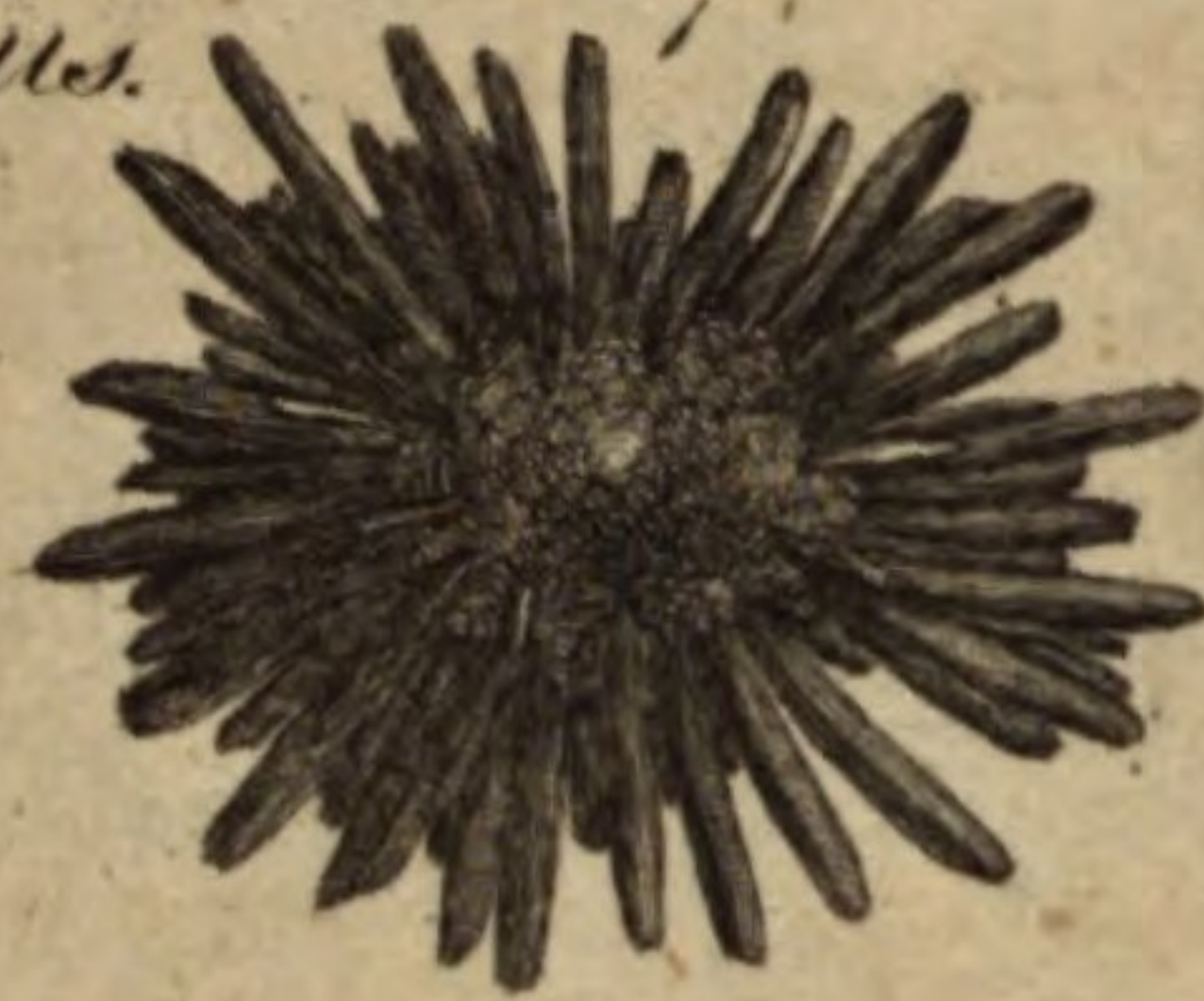
17

What substances are most proper.

Echeneis.



Echinus.



Plater.



ELECTRICITY.

Fig. 2.

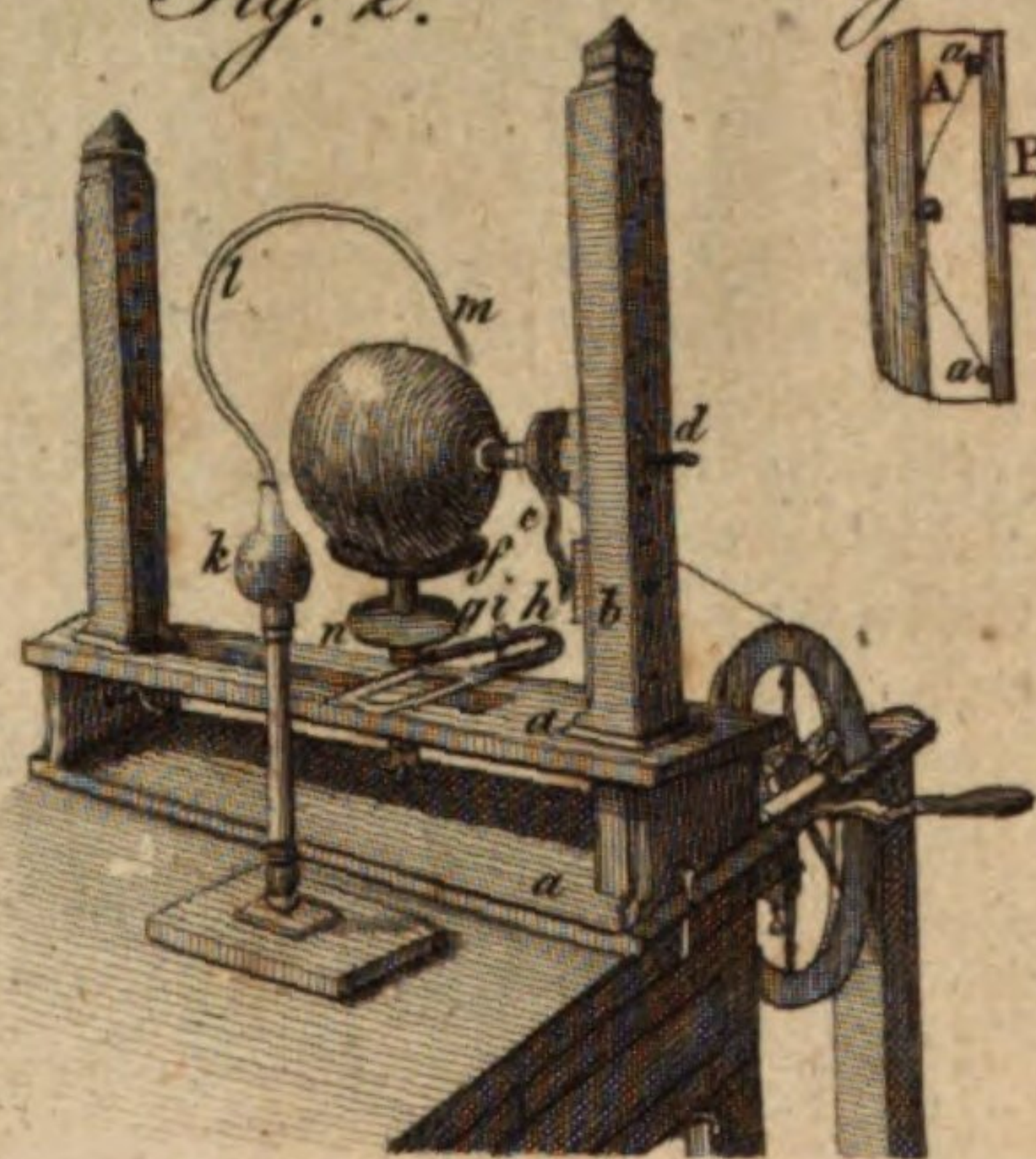


Fig. 1.



Fig. 3.

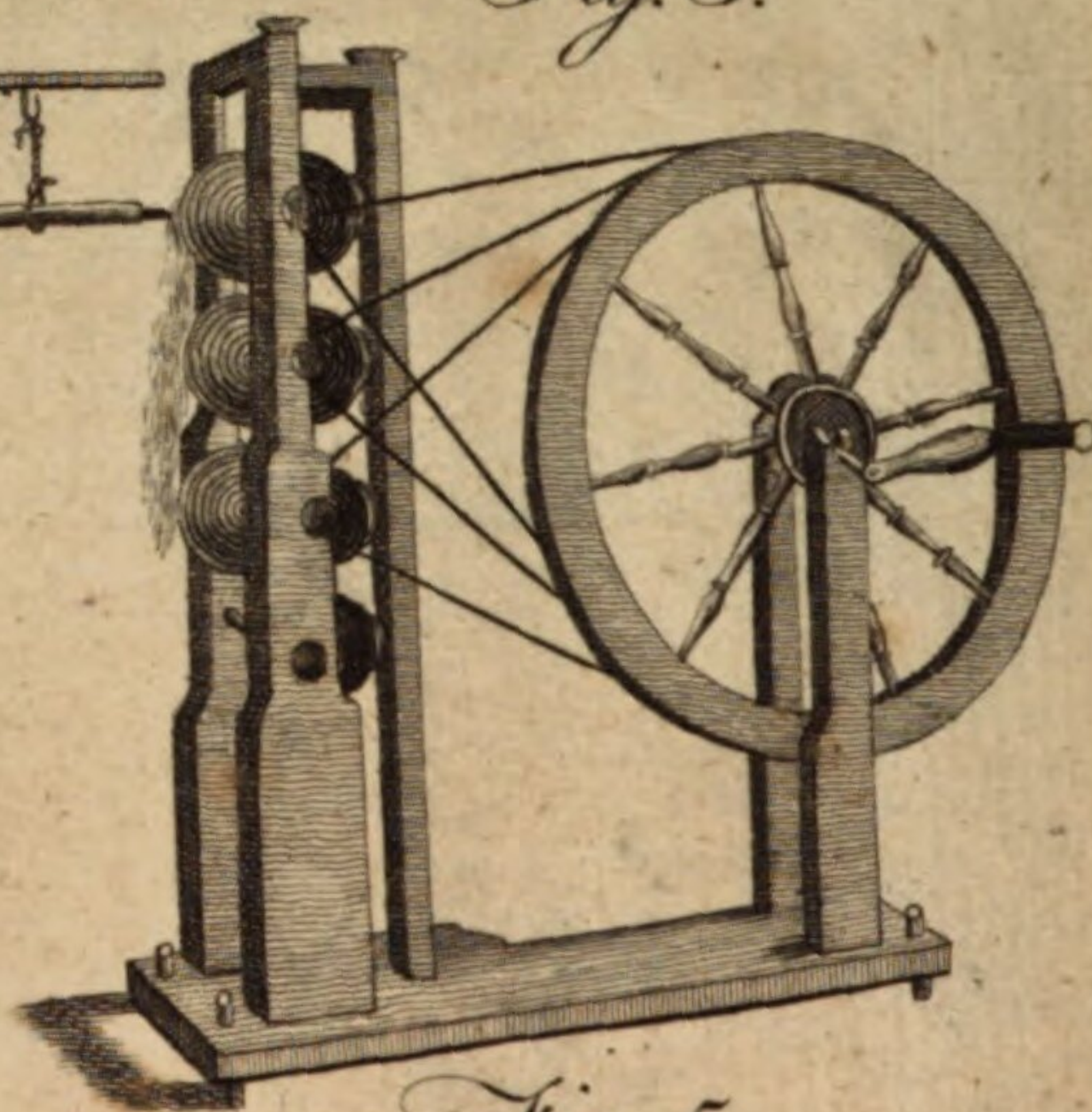


Fig. 4.

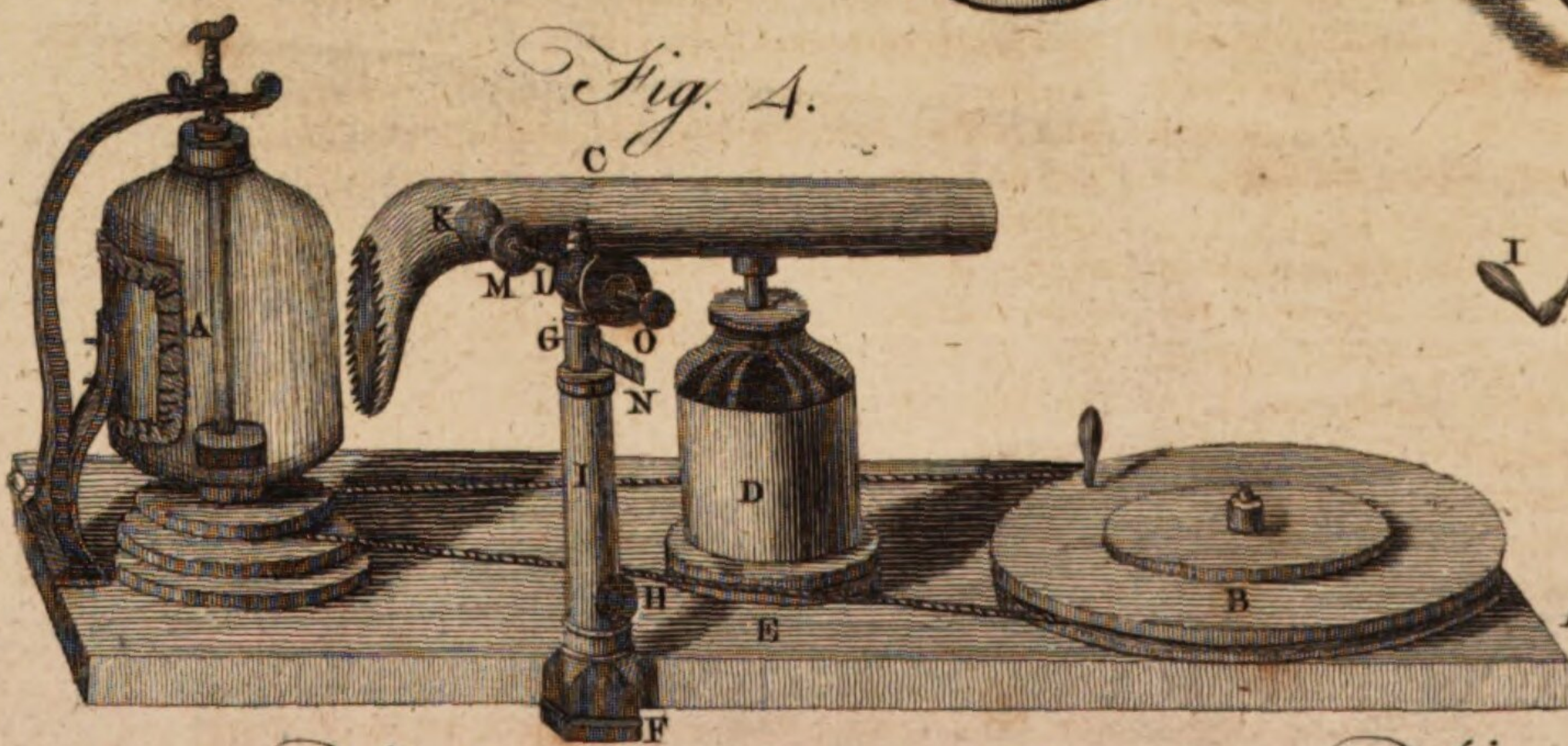


Fig. 5.

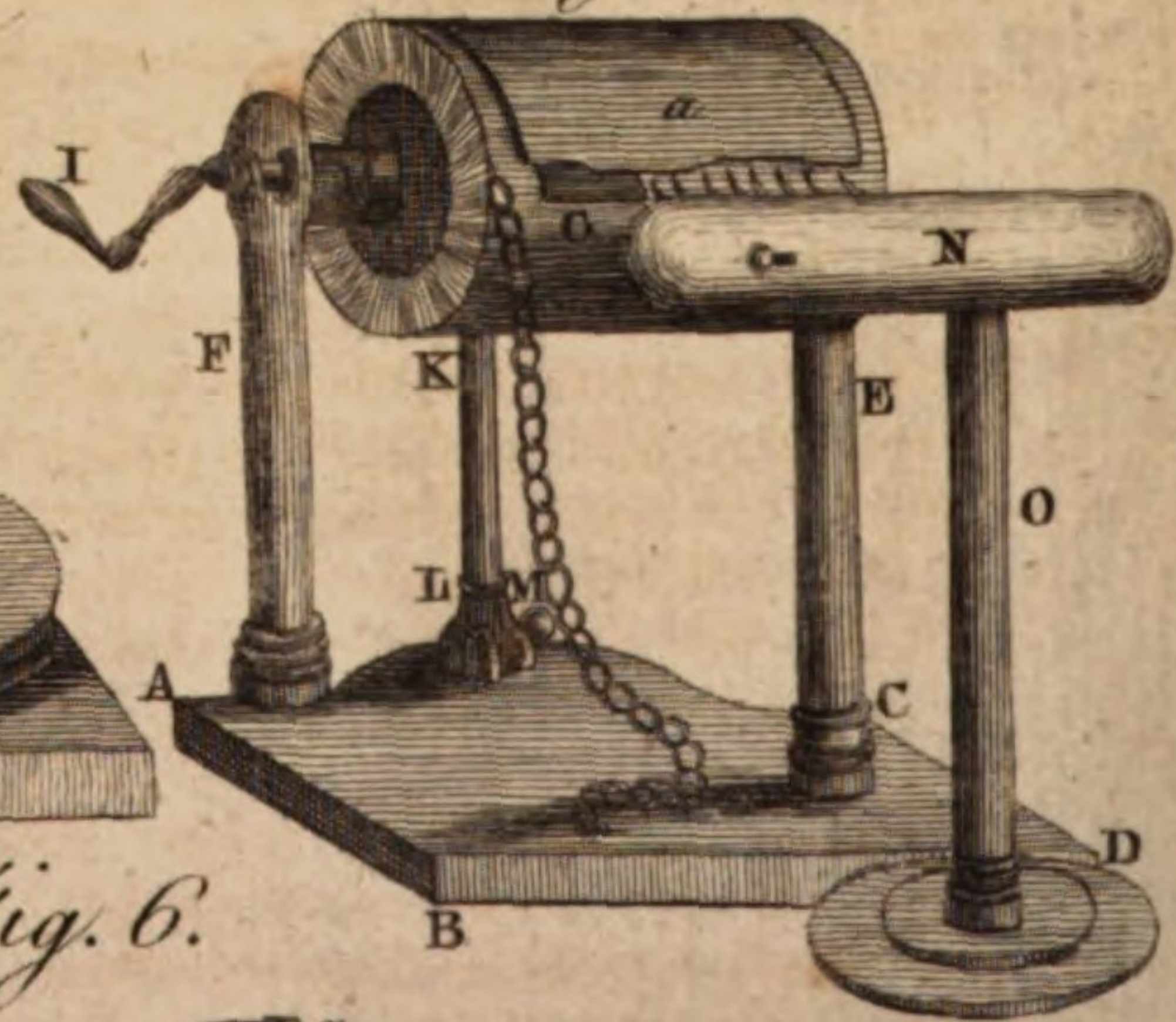


Fig. 7.

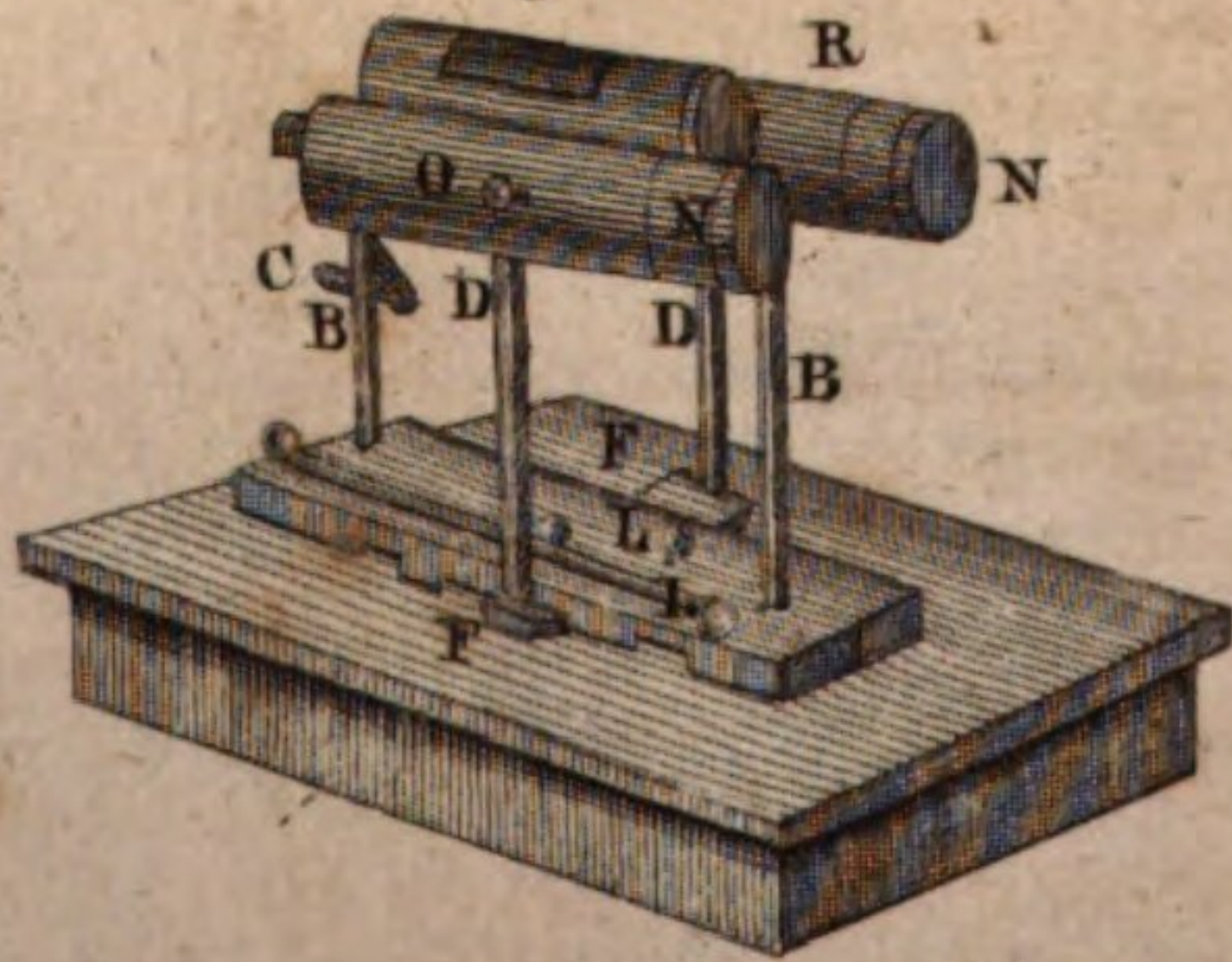
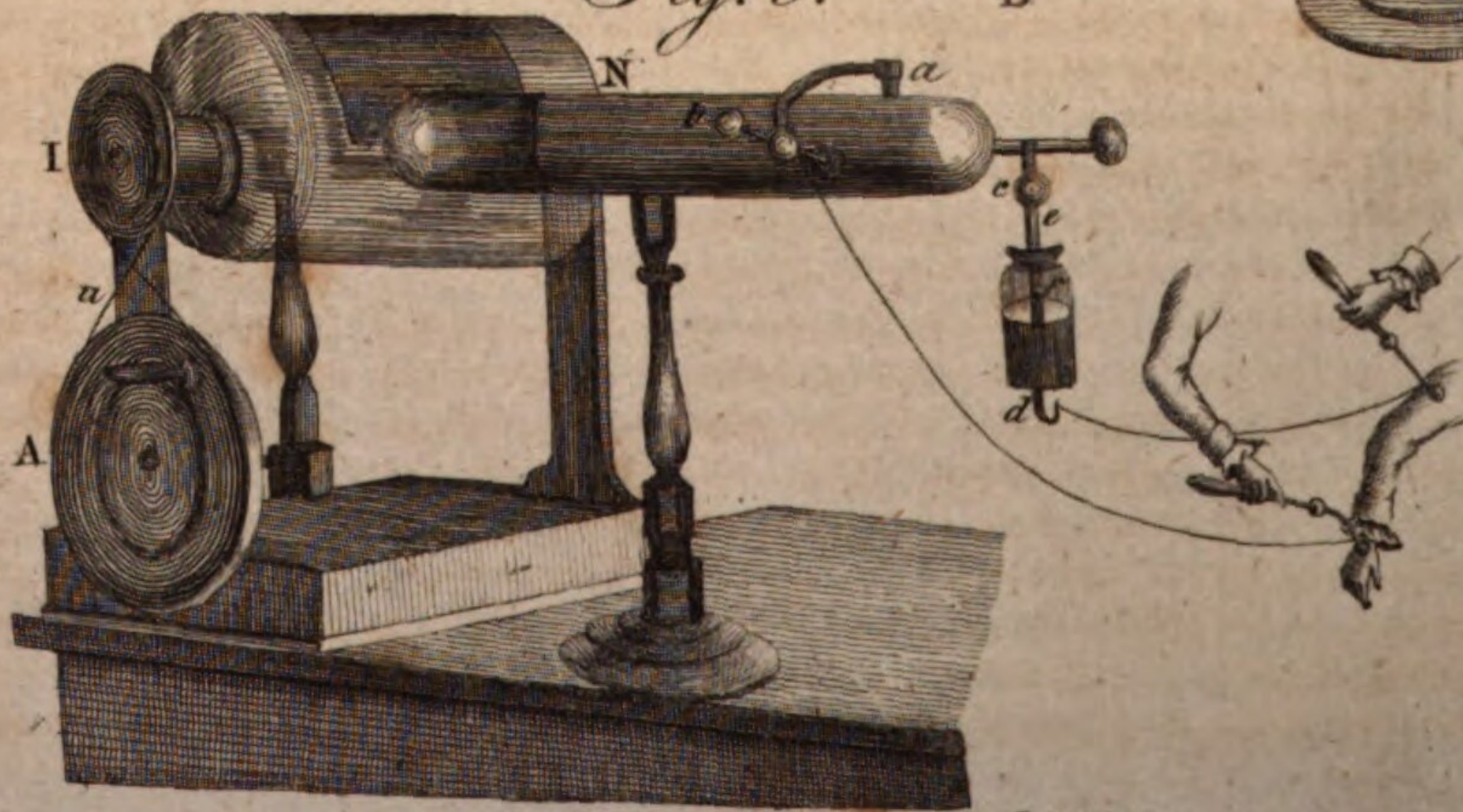


Fig. 6.



A. Bell Pin. Wal. sculptor fecit.

Apparatus. twelve inches diameter and two feet long, which are perhaps as large as the workmen can conveniently make them. The glass generally used is the best flint; though it is not absolutely determined which kind of metal is the best for electrical globes or cylinders. The thickness of the glass seems immaterial, but perhaps the thinnest is preferable. It has often happened, that glass globes and cylinders, in the act of whirling, have burst in innumerable pieces with great violence, and with some danger to the by-standers. Those accidents are supposed to happen when the globes or cylinders, after being blown, are suddenly cooled. It will therefore be necessary to enjoin the workmen to let them pass gradually from the heat of the glass-house to the atmospherical temperature.

It has been long questioned, whether a coating of some electric substance, as rosin, turpentine, &c. on the inside surface of the glass, has any effect to increase its electrical power; but now it seems pretty well determined, that if it does not increase the power of a good glass globe or cylinder, at least it does considerably improve a bad one.

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Composition for coating globes.
The most approved composition for lining glass globes or cylinders, is made with four parts of Venice turpentine, one part of rosin, and one part of bees-wax. This composition must be boiled for about two hours over a gentle fire, and stirred very often: afterwards it is left to cool, and reserved for use. When a globe or cylinder is to be lined with this mixture, a sufficient quantity of it is to be broken into small pieces, and introduced into the glass; then, by holding the glass near the fire, the mixture is melted, and equally spread over all its internal surface to about the thickness of a sixpence. In this operation, care must be taken that the glass be made hot gradually, and be continually turned, so that it may be heated equally in all parts, otherwise it is apt to break in the operation.

19
How the machine is to be set in motion.
In respect to the engine which is to give motion to the electric, multiplying wheels have been generally used, which, properly adapted, might give the electric a quick motion, while they are conveniently turned by a winch. The usual method is, to fix a wheel on one side of the frame of the machine, which is turned by a winch, and has a groove round its circumference. Upon the brass cap of the neck of the glass globe, or one of the necks of the cylinder, a pulley is fixed, whose diameter is about the third or fourth part of the diameter of the wheel: then a string or strap is put over the wheel and the pulley; and, by these means, when the winch is turned, the globe or cylinder makes three or four revolutions for one revolution of the wheel. There is an inconvenience generally attending this construction, which is, that the string is sometimes so very slack, that the machine cannot work. To remedy this inconvenience, the wheel should be made moveable with respect to the electric, so that by means of a screw it might be fixed at the proper distance; or else the pulley should have several grooves of different radii upon its circumference.

It has been customary with some, to turn the cylinder simply with a winch, without any accelerated motion; but that seems not sufficient to produce the greatest electric power the glass is capable of giving; for the globe or cylinder should properly make about

six revolutions in a second, which is more than can be conveniently done with the winch only. This method, however, on account of its simplicity and easy construction, should not be disregarded, and it may be conveniently used when no very great power is required.

Instead of the pulley and the string as above described, a wheel and pinion, or a wheel and an endless screw, has been also used. This construction may answer tolerably well for small table machines; but it must be constructed with great nicety; otherwise it is apt to make a disagreeable rattling, and, without frequent oiling, soon wears away by the great friction of its parts.

The next thing belonging to the electrical machine necessary to be described, is the rubber which is to excite the electric. The rubber, as it is now made, consists of a cushion of red Basil skin stuffed with hair or flannel, and fastened to a piece of wood well rounded at the edges. To this is glued a flap of Persian black silk, which nearly goes over one half of the cylinder. The method of using the amalgam is by spreading it on a separate piece of leather, and applying it occasionally to the under part of the cylinder while turning. Thus only a very small part of the amalgam is consumed, at the same time that the glass is very strongly excited. The most powerful composition for exciting an electrical cylinder is found to be an amalgam of mercury and zinc, in the proportion of one part of the former to five of the latter. The mercury ought to be previously triturated with some melted grease or bees-wax, by which means the amalgam will be the finer. The composition called *Aurum Mosaicum*, *Aurum musivum*, or *Mosaic gold**, will answer very near as well, though somewhat less cleanly and agreeable. The rubber itself should be supported by a spring; by which means it will easily suit any inequalities that may be on the surface of the glass; and by a screw, it may be made to press more or less as occasion requires. It should likewise be insulated in the most perfect manner; as, when insulation is not required, it may be easily taken off by a chain or wire hung upon it, and thus communicate with the earth or with any unelectrified body; but where there is no contrivance for insulating the rubber, it is impossible to perform many of the most curious electric experiments. In short, to construct the rubber properly, it must be made in such a manner, that the side it touches in whirling may be as perfect a conductor as it can be made, in order to supply electricity as quick as possible; and the opposite part should be as perfect a non-conductor as possible, in order that none of the fluid accumulated upon the glass may return back to the rubber; which has been found to be the case when the rubber was not made in a proper manner.

Mr William Jones of Holborn, London, instrument-maker, has made a considerable improvement on this part of electrical machines by a very simple contrivance. It consists in a spring placed within the rubber itself; the action of which is found to be better suited for adapting the rubber to the inequalities of the glass, than that placed entirely without the rubber. It consists of a piece of flexible iron or brass, represented edgeways by A fig. 1.; and it is evident that it acts in a much more parallel and uniform manner than the former,

Apparatus. former, which is constantly changing the pressure of the line of contact betwixt the rubber and cylinder while it passes from the under to the upper side, and thus rendering the effect inconstant and uncertain.

24
Prime conductor, &c.

We come now to consider the prime conductor, or first conductor; which is nothing more than an insulated conducting substance, furnished with one or more points at one end, in order to collect the electricity immediately from the electric. When the conductor is of a moderate size, it is usual to make it of hollow brass; but when it is very large, then, on account of the price of the materials, it is made of pasteboard covered with tin-foil or gilt paper. The conductor is generally made cylindrical; but let the form be what it will, it should always be made perfectly free from points or sharp edges: and if holes are to be made in it, which on many accounts are very convenient, they should be well rounded, and made perfectly smooth. Further, that end of the prime conductor which is at the greatest distance from the electric ought to be made larger than the rest, as the strongest exertion of the electric fluid in escaping from the conductor is always at that end.

It has been constantly observed, that the larger the prime conductor is, the longer and denser spark can be drawn from it; and the reason of this is, that the quantity of electricity discharged in a spark, is nearly proportional to the size of the conductor: on this account, the prime conductor is now made much larger than what was formerly used. Its size, however, may be so large, that the dissipation of the electricity from its surface, may be greater than what the electric can supply; in which case, so large a conductor would be nothing more than an unwieldy and disagreeable incumbrance.

Before we quit the electrical machine, it should be observed, that, besides the above-mentioned parts, it is necessary to have a strong frame to support the electric, the rubber, and the wheel. The prime conductor should be supported by stands, with pillars of glass or baked wood, and not by silk strings, which admit of continual motion. In short, the machine, the prime conductor, and any other apparatus actually used, should be made to stand as steady as possible, otherwise many inconveniences will arise.

Besides the electrical machine, the electrician should be provided with glass tubes of different sizes, a pretty large stick of sealing-wax, or a glass tube covered with sealing-wax, for the negative electricity. He should, at least, not be without a glass tube about three feet long and one inch and a half in diameter. This tube should be closed at one end, and at the other end should have fixed a brass cap with a stop-cock; which is useful in case it should be required to condense or rarify the air within the tube.

The best rubber for a tube of smooth glass is the rough side of black oiled silk, especially when it has some amalgam rubbed upon it; but the best rubber for a rough glass tube, a stick of baked wood, sealing-wax, or sulphur, is soft new flannel.

25
Directions for coating jars, &c.

The instruments necessary for the accumulation of electricity are coated electrics; among which, glass coated with conductors obtains the principal place: on account of its strength, it may be formed into any shape, and it will receive a very great charge. The

form of the glass is immaterial with respect to the charge it will contain; its thickness only is to be considered: for the thinner it is, the more easily will it receive the utmost charge it can bear; but it is at the same time more subject to be broken: for this reason, therefore, a thin coated jar or plate may be used very well by itself, and it is very convenient for many experiments; but when large batteries are to be constructed, then it is necessary to use glass a little thicker, and care should be taken to have them perfectly well annealed. If a battery is required of no very great power, as containing about eight or nine square feet of coated glass, common pint or half-pint phials may be made use of. They may be easily coated with tin-foil, sheet-lead, or gilt-paper, on the outside, and brass-filings on the inside: they occupy a small space, and, on account of their thinness, hold a very good charge. But when a large battery is required, then these phials cannot be used, for they break very easily; and for that purpose, cylindrical glass jars of about 15 inches high, and four or five inches in diameter, are the most convenient.

When glass plates or jars, having a sufficiently large opening, are to be coated, the best method is to coat them with tin-foil on both sides, which may be fixed upon the glass with varnish, gum-water, bees-wax, &c. but in case the jars have not an aperture large enough to admit the tin-foil, and an instrument to adapt it to the surface of the glass, then brass-filings, such as are sold by the pin-makers, may be advantageously used; and they may be stuck on with gum-water, bees-wax, &c. but not with varnish, for this is apt to be set on fire by the discharge. Care must be taken that the coatings do not come very near the mouth of the jar, for that will cause the jar to discharge itself. If the coating is about two inches below the top, it will in general do very well: but there are some kinds of glass, especially tinged glass, that when coated and charged, have the property of discharging themselves more easily than others, even when the coating is five or six inches below the edge. There is another sort of glass, like that of which Florence flasks are made, which, on account of some unvitified particles in its substance, is not capable of holding the least charge. On these accounts, therefore, whenever a great number of jars are to be chosen for a large battery, it is advisable to try some of them first, so that their quality and power may be ascertained.

Electricians have often endeavoured to find some other electric, which might answer better than glass for this purpose, at least be cheaper; but, except Father Beccaria's method, which may be used very well, no remarkable discovery has been made relating to this point. He took equal quantities of very pure colophonium, and powder of marble sifted exceedingly fine, and kept them in a hot place a considerable time, where they became perfectly free from moisture: he then mixed them, and melted the composition in a proper vessel over the fire; and, when melted, poured it upon a table, upon which he had previously stuck a piece of tin-foil, reaching within two or three inches of the edge of the table. This done, he endeavoured with a hot iron to spread the mixture all over the table as equally as possible, and to the thickness of one-tenth of an inch: he afterwards coated it with another piece of tin-foil reaching within about two inches of the edge.

26
Another substance capable of answering the purpose of glass.

Apparatus.

edge of the mixture: in short, he coated a plate of this mixture like a plate of glass. This coated plate, from what he says, seems to have had a greater power than a glass plate of the same dimensions, even when the weather was not very dry: and if it is not subject to break very easily by a spontaneous discharge, it may be very conveniently used; for it doth not very readily attract moisture, and consequently may hold a charge of electricity better, and longer, than glass: besides, if broken, it may be repaired by a hot iron; but glass, when broken, cannot so easily be repaired.

27
Discharging rod, electrometers, &c.

When a jar, a battery, or in general a coated electric, is to be discharged, the operator should be provided with an instrument called the *discharging rod*, which consists of a metal rod sometimes straight, but more commonly bended in the form of a C: they are made also of two joints, so as to open like a kind of compasses. This rod is furnished with metal knobs at its extremities, and has a non-conducting handle, generally of glass or baked wood, fastened to its middle. When the operator is to use this instrument, he holds it by the handle; and touching one of the coated sides of the charged electric with one knob, and approaching the other knob to the other coated side, or some conducting substance communicating with it, he completes the communication between the two sides, and discharges the electric.

The instruments to measure the quantity, and ascertain the quality, of electricity, are commonly called *electrometers*, and they are of four sorts: 1. The single thread; 2. the cork or pith balls; 3. the quadrant; and, 4. the discharging electrometer. The second sort of electrometer, *i. e.* the cork-ball electrometer, was invented by Mr Canton; the discharging electrometer was invented by Mr Lane, and hath been improved by Mr Henley; another on a different principle by Mr Kinnerley; and the quadrant electrometer, which is of latest invention, is a contrivance of Mr Henley.

Besides the apparatus above described, there are several other instruments useful for various experiments; but these will be described occasionally. The electrician, however, ought to have by him, not only a single coated jar, a single discharging rod, or, in short, only what is necessary to perform the common experiments; but he should provide himself with several plates of glass, with jars of different sizes, with a variety of different instruments of every kind, and even tools for constructing them; in order that he may readily make such new experiments as his curiosity may induce him to try, or that may be published by other ingenious persons who are pursuing their researches in this branch of philosophy.

§ 2. Description of the most useful Electrical Machines.

28
Description of Doctor Priestley's machine.

Fig. 2.

THE first which may be mentioned is that described by Dr Priestley in his history of electricity; which, on account of its extensive use, may be deservedly called a *universal electrical machine*.—The basis consists of two oblong boards *a a*, which are placed in a situation parallel to one another, about four inches asunder, and kept in that position by two pieces of wood adapted for the purpose. These boards, when set horizontally on a table, and the lowermost of them fixed with iron cramps, form the support of two perpendicular pillars of baked wood, and of the rubber of the machine. One of the pillars, together with the spring support-

ing the rubber, slides in a groove *a*, which reaches almost the whole length of the upper board; and, by means of a screw, may be placed at any required distance from the pillar *b*, which is fixed, being put through a mortice in the upper board, and fastened to the lower. In these two pillars are several holes for the admittance of the spindles of different globes; and as they may be situated at any distance from one another, they may be adapted to receive not only globes, but cylinders and spheroids of different sizes. "In this machine (says Dr Priestley), more than one globe or cylinder may be used at once, by fixing one above the other in the different holes of the pillars; and by adapting to each a proper pulley, they may be whirled all at once, to increase the electricity." But this construction has one capital defect, that rubbers cannot be conveniently applied; so that the power of several globes put together in this manner, though greater than one, is by no means equal to what it would be if the power of them all taken singly were united. Fig. 3. shows a machine of this kind contrived by Dr Watson.

Apparatus.

29
Several globes may be made to unite their power in this machine.

The rubber ought to be made as above directed. It is supported by a socket which receives the cylindrical axis of a round and flat piece of glass or baked wood *g*, the opposite part of which is inserted into the socket of a bent steel spring *b*. These parts are easily separated, so that the rubber, or the piece of wood that serves to insulate it, may be changed at pleasure. The spring admits of a twofold alteration of position; being capable of either slipping along the groove, or moving in the contrary direction, the groove being wider than the screw that fastens the spring, so as to give it every desirable position with regard to the globe or cylinder; and it is besides furnished with a screw which makes it press harder or lighter as the operator chooses. The wheel of this machine is fixed to the table at *e*, and has several grooves for admitting more strings than one, in case that two or three globes or cylinders are used at a time; and as it is disengaged from the frame of the machine, the latter may be screwed at different distances from the former, and so would be suited to the variable length of the string. The chain connected with the rubber at *n* is for making a communication with the table, when insulation is not wanted. The prime conductor is made of copper, hollow, and in the form of a pear; having its neck placed upwards, and its bottom, or rounded part *k*, placed on a stand of glass or baked wood. An arched wire *l* proceeds from its neck, having an open ring at its end, in which some small pointed wires *m* are hung, that by playing lightly on the globe or cylinder collect the electric fluid from it.

Next to Dr Priestley's machine is one invented by Dr Ingenhousz, and which for its simplicity and conciseness makes a fine contrast with the former.—This machine consists of a circular glass-plate about one foot diameter, which is turned vertically by a winch fixed to the iron axis that passes through its middle; and it is rubbed by four cushions, each about two inches long, situated at the opposite ends of the vertical diameter. The frame consists of a bottom board, about a foot square, or a foot long and six inches broad, which, when the machine is to be used, may be fastened by an iron crank to the table. Upon this board two other slender and smaller ones are raised, which lie parallel

30
Of Dr Ingenhousz's

Apparatus. to one another, and are fastened together at their top by a small piece of wood. These upright boards support in their middle the axis of the plate, and to them the rubbers are fastened. The conductor is of hollow brass; and from its extremities branches are extended, which, coming very near the extremity of the glass, collect the electricity from it.

The power of this machine is perhaps more than a person would imagine by looking at it. It may be objected, that this construction will not easily admit of the rubbers being insulated, nor consequently be adapted to a great variety of experiments: but at the same time it must be allowed, that it is very portable, that it is not very liable to be out of order, and that it has a power sufficiently strong for physical purposes; on which account it may be conveniently used.

31
Mr Reid's
portable
machine.

Fig. 4. represents a very portable electrical machine invented by Mr Read, and improved by Mr Lane. *A* is the glass cylinder, moved vertically by means of the pulley at the lower end of the axis. This pulley is turned by a large wheel *B* which lies parallel to the table. There are three pulleys of different dimensions marked in the figure; one of which revolves four times for every revolution of the large wheel *B*. The conductor *C* is furnished with points to collect the fluid, and is screwed to the wire of a coated jar *D*, which stands in a socket between the cylinder and the wheel. The figure also represents the manner of applying Mr Lane's electrometer to this machine; of which an account shall be given afterwards.

Electrical machines have of late years undergone some very essential alterations and improvements; both from the suggestions of private electricians and the inventions of Messrs Adams, Nairne, and Jones, instrument makers of London. We shall subjoin a description of the most approved ones.

32
A machine
proper for
philosophi-
cal purpo-
ses.

Fig. 5. represents a most convenient machine for philosophical purposes, and whose power is equal to that of much larger ones of the old construction. The frame of this machine consists of the bottom board *A B C D*; which, when the machine is to be used, must be fastened to the table by two brass or iron cramps made for that purpose. Upon the bottom board there are two round pillars *E F* perpendicularly raised; which will best answer the purpose if made of baked wood. These serve to support the cylinder *G* by the axles of the brass or wood caps *H*. From one of these proceeds the long axle *H*, going through an hole in the pillar *F*; having a simple winch *I* fixed on its square end; or sometimes, as in fig. 6. below a pulley *I*. On the circumference of this pulley are several grooves in order to suit the variable length of the string *a*, which goes round one of them, as well as round the large multiplying wheel *A*. The other cap of the cylinder has a small cavity which fits the conical extremity of a strong screw proceeding from the pillar. The wheel *A*, which is moved by the handle, turns round a strong axle proceeding from about the middle of the same pillar. In small machines the simple winch may be adopted with great advantage, as is represented fig. 5. as not being liable to disorder; but in large ones the multiplying wheel is indispensibly necessary.

Fig. 6.

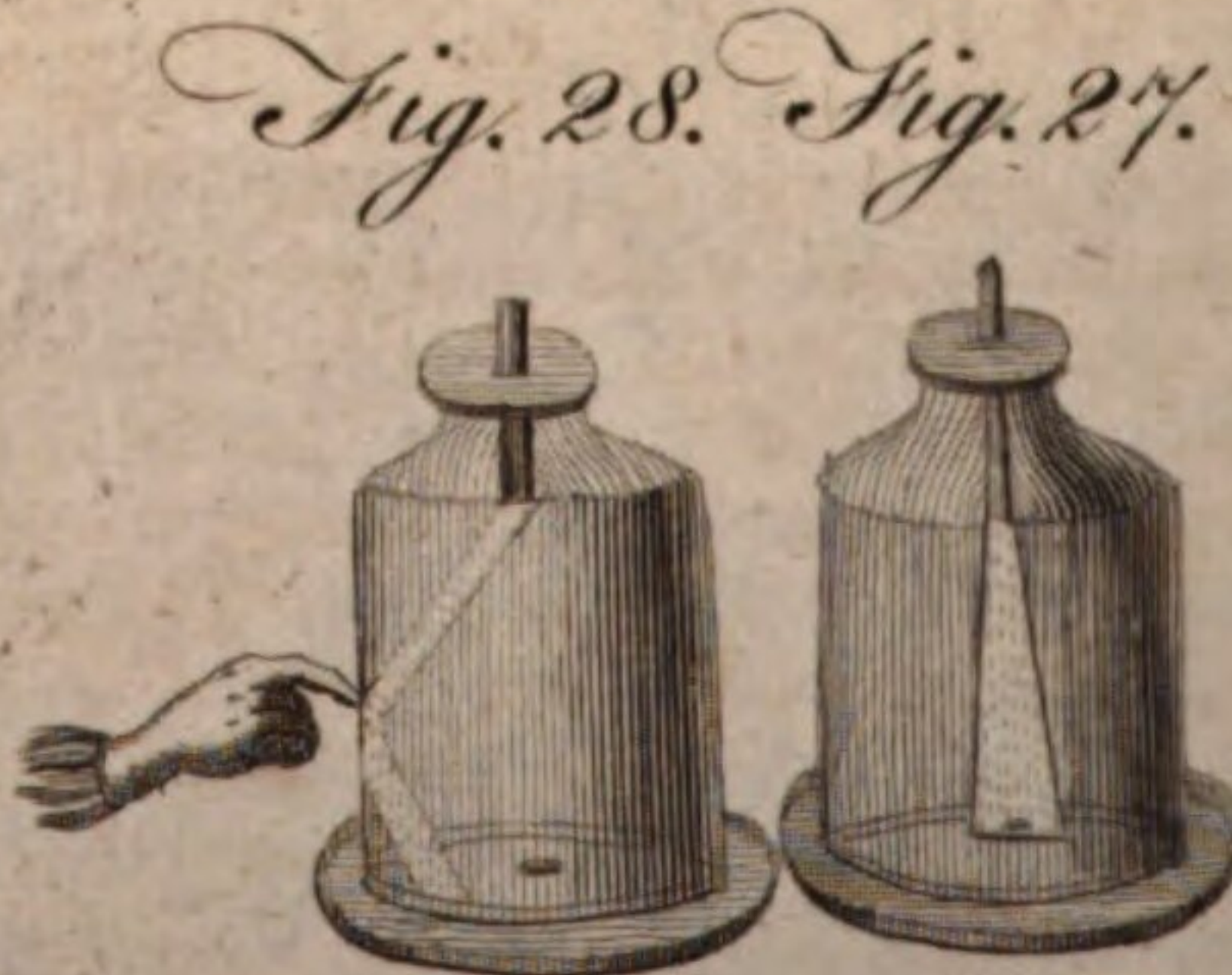
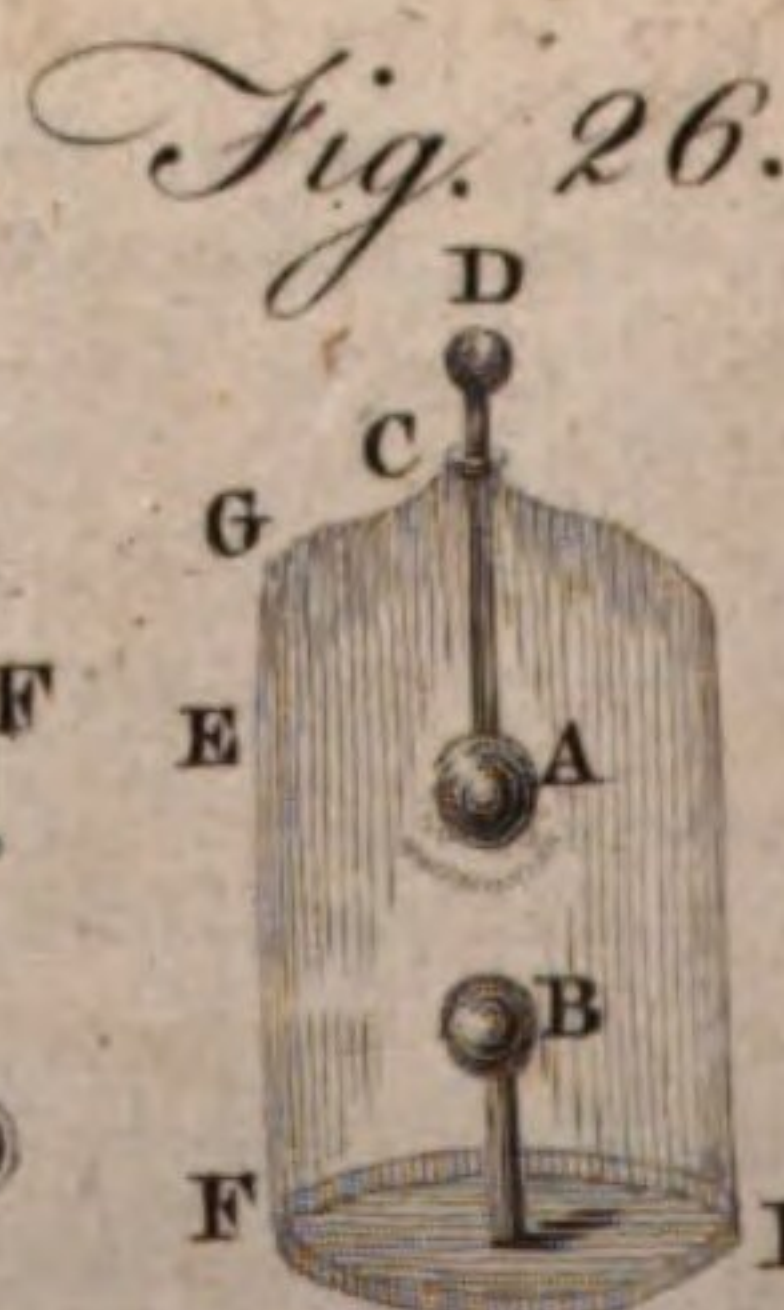
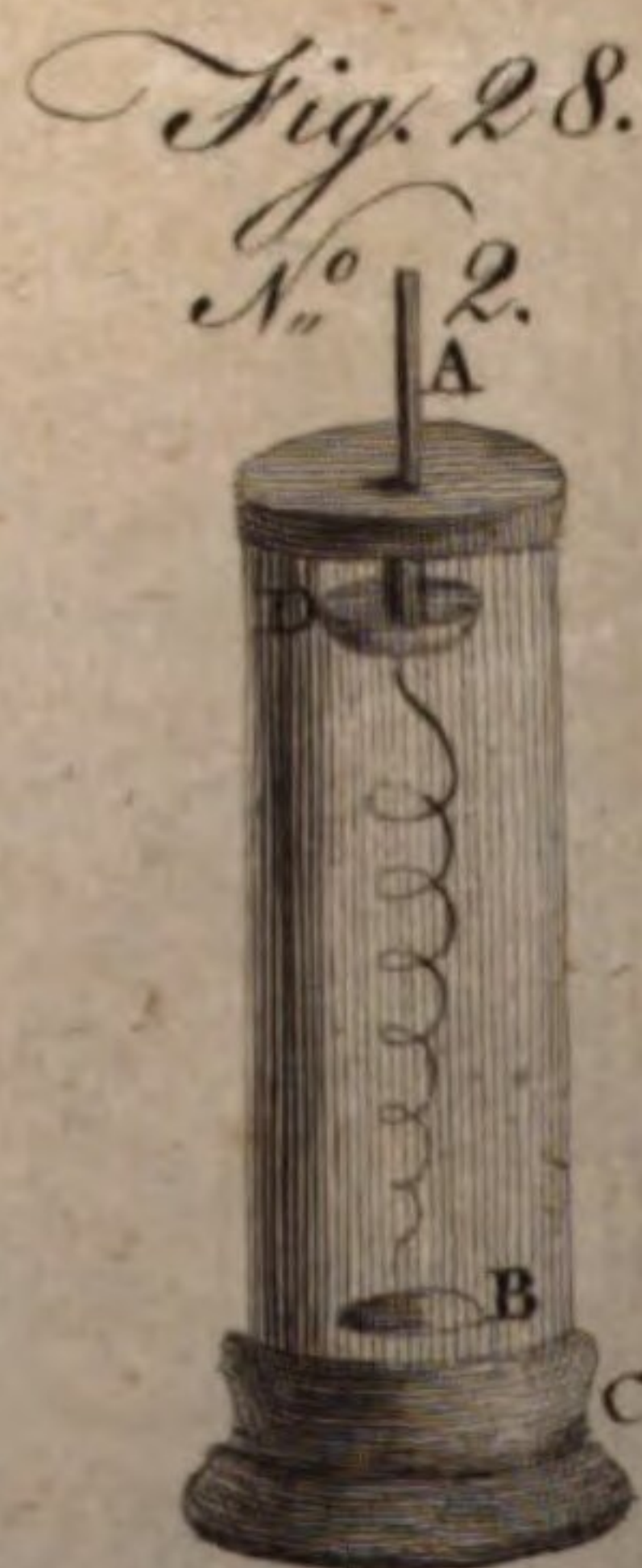
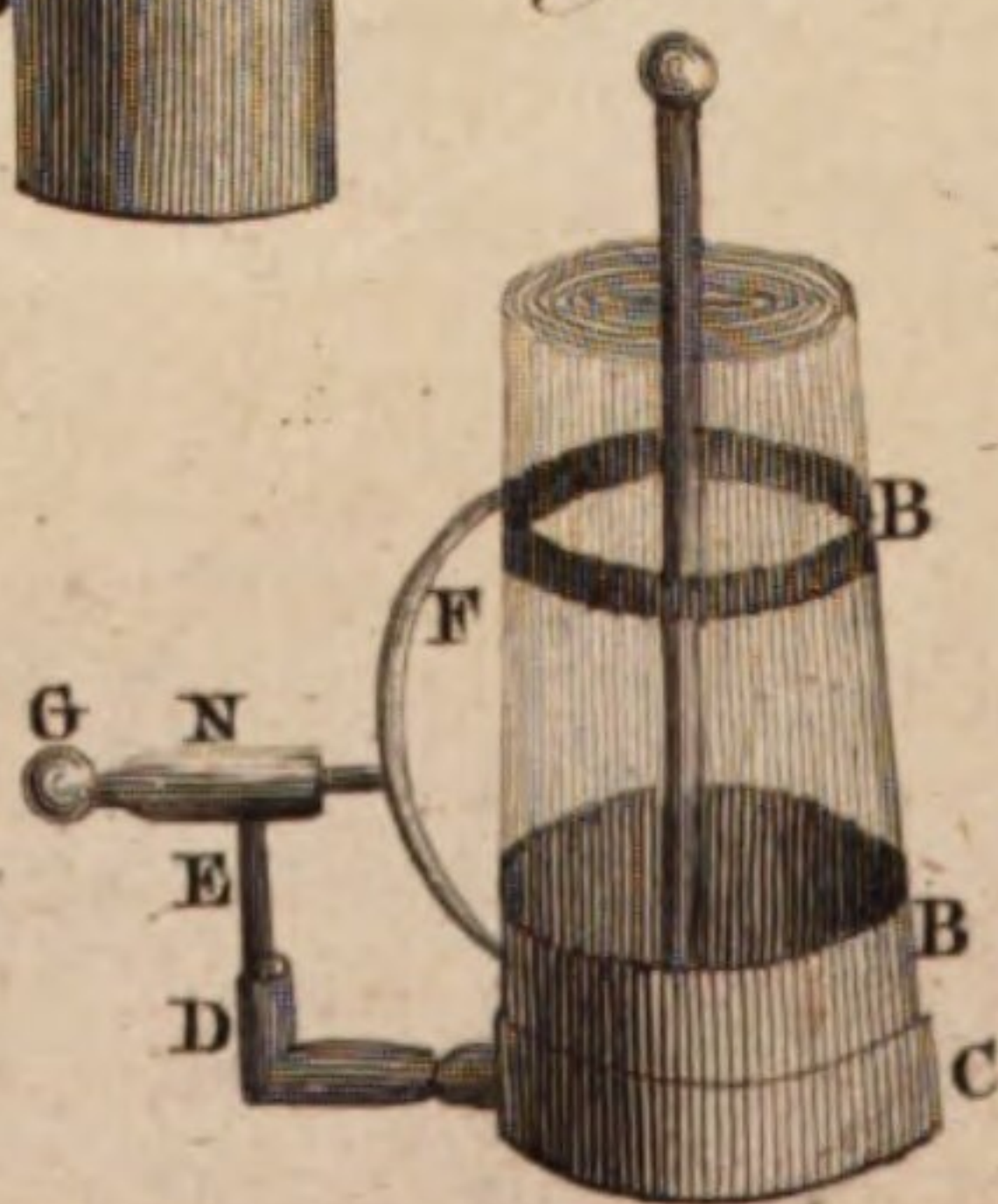
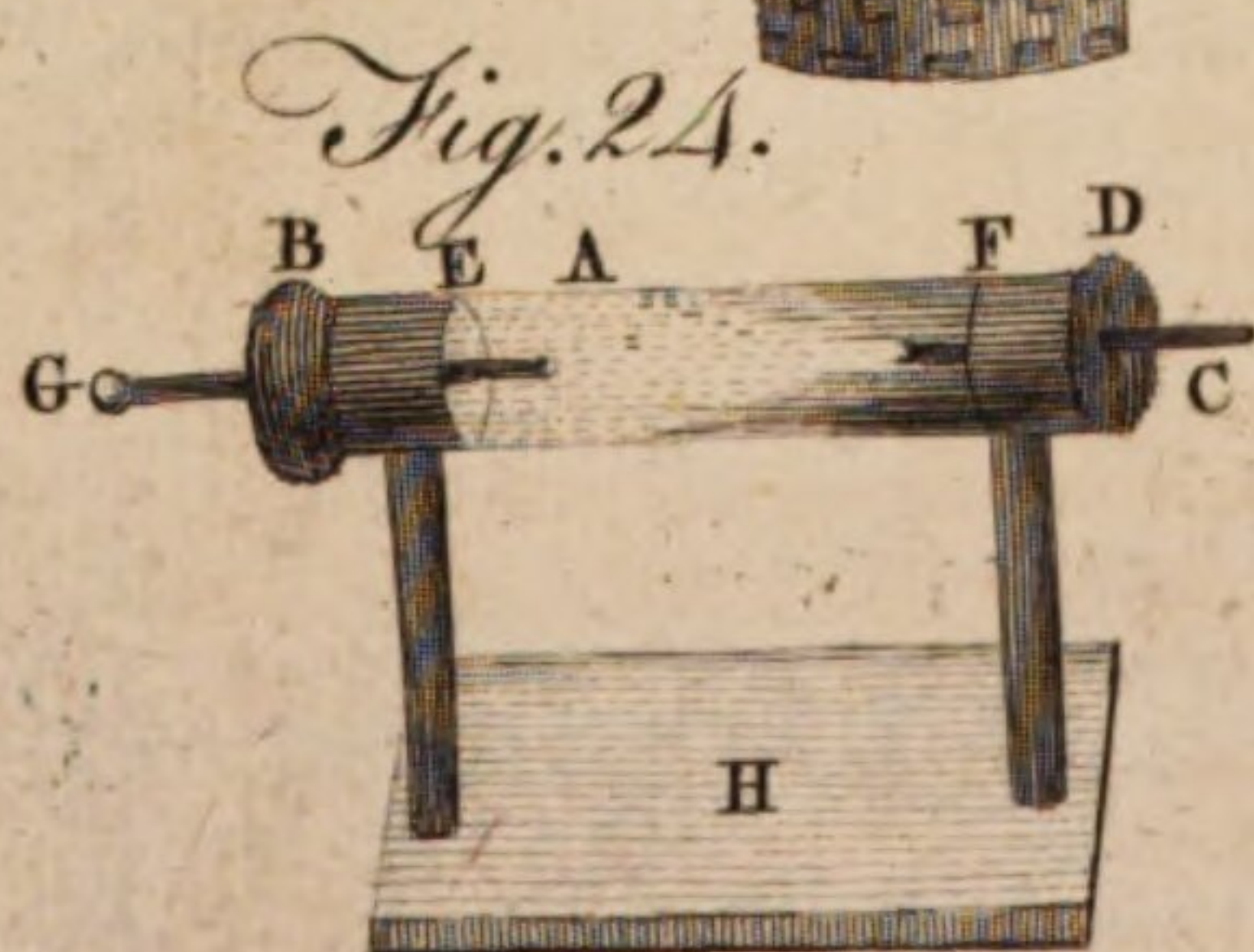
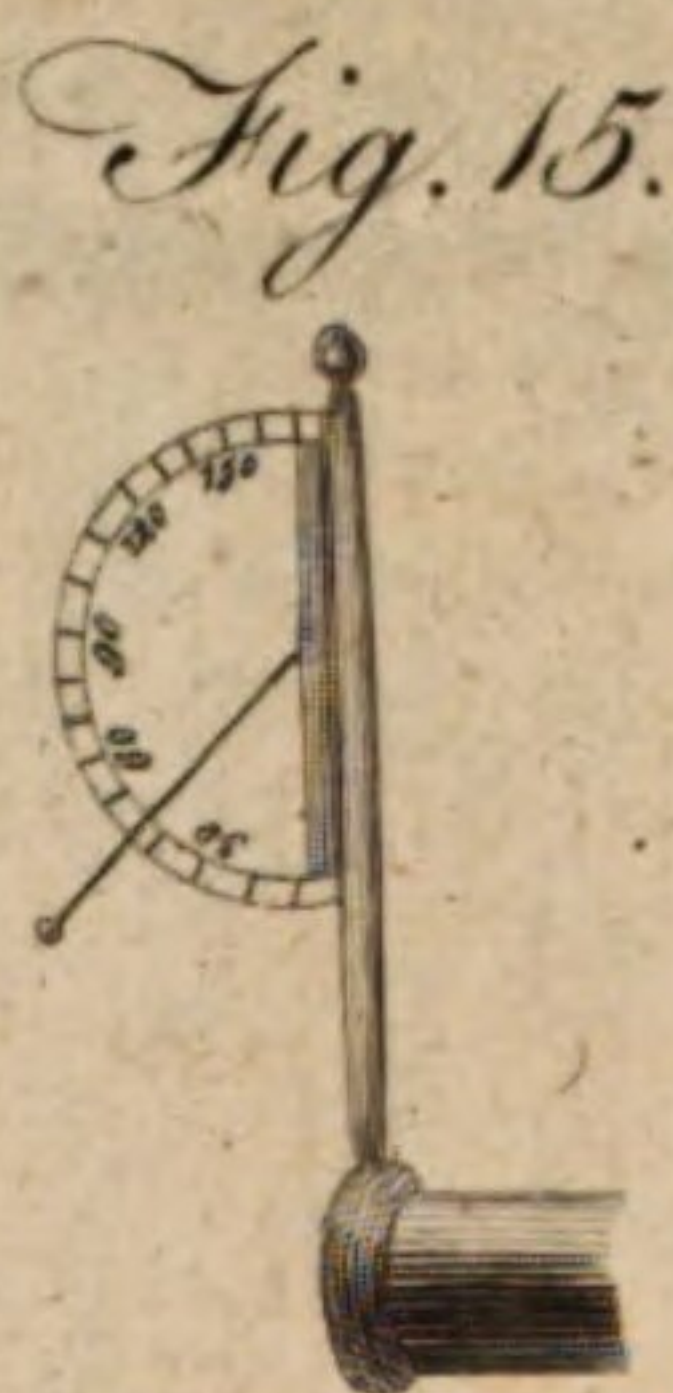
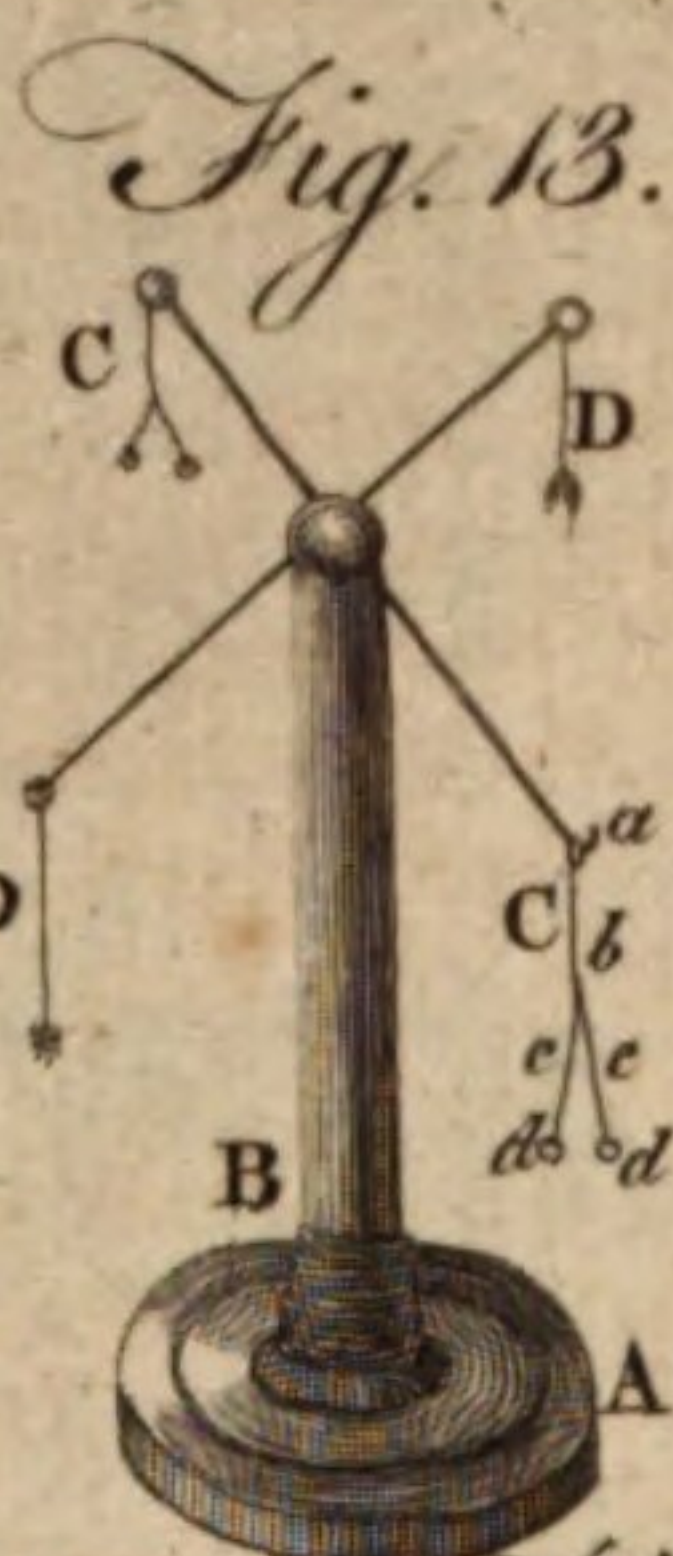
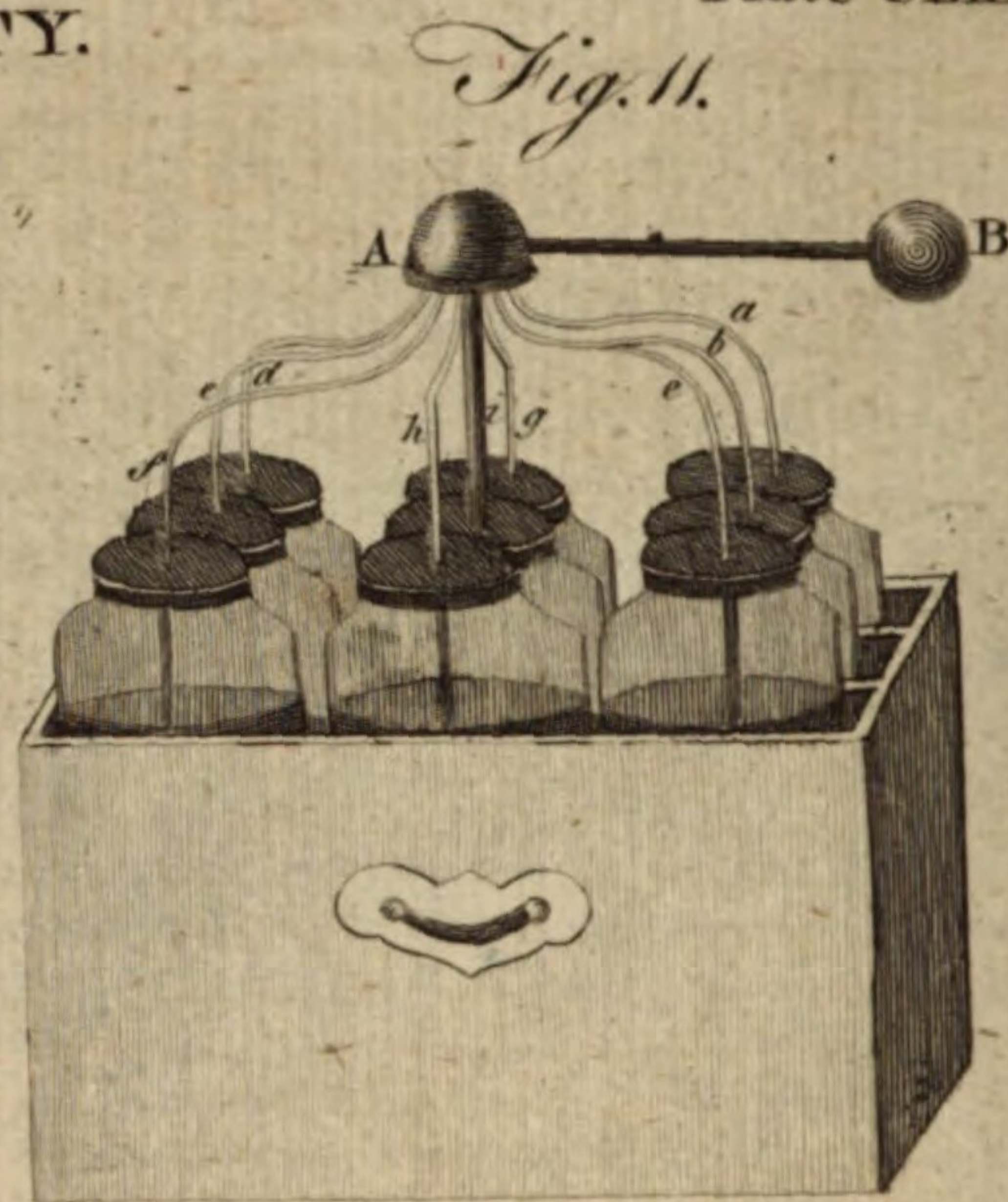
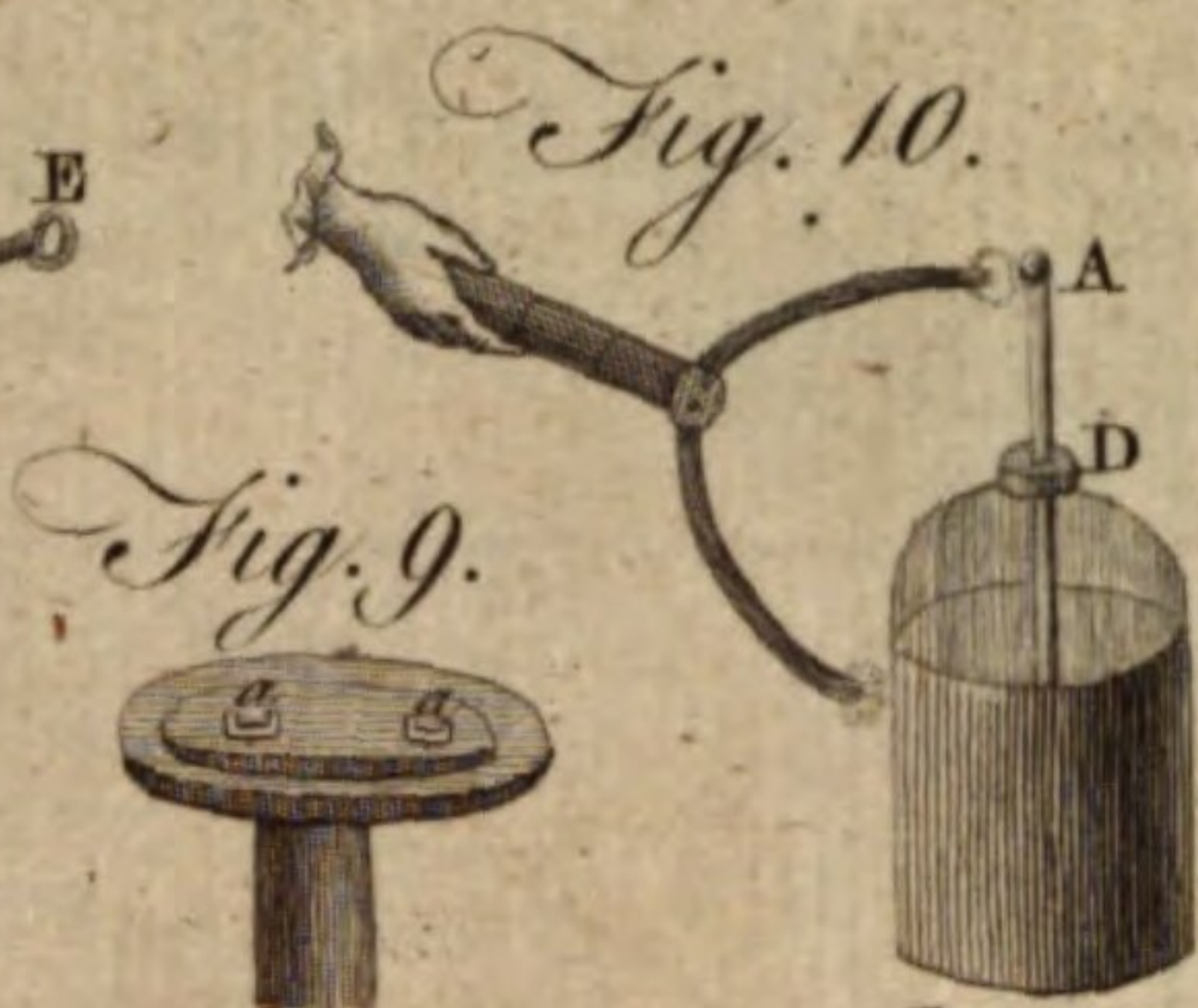
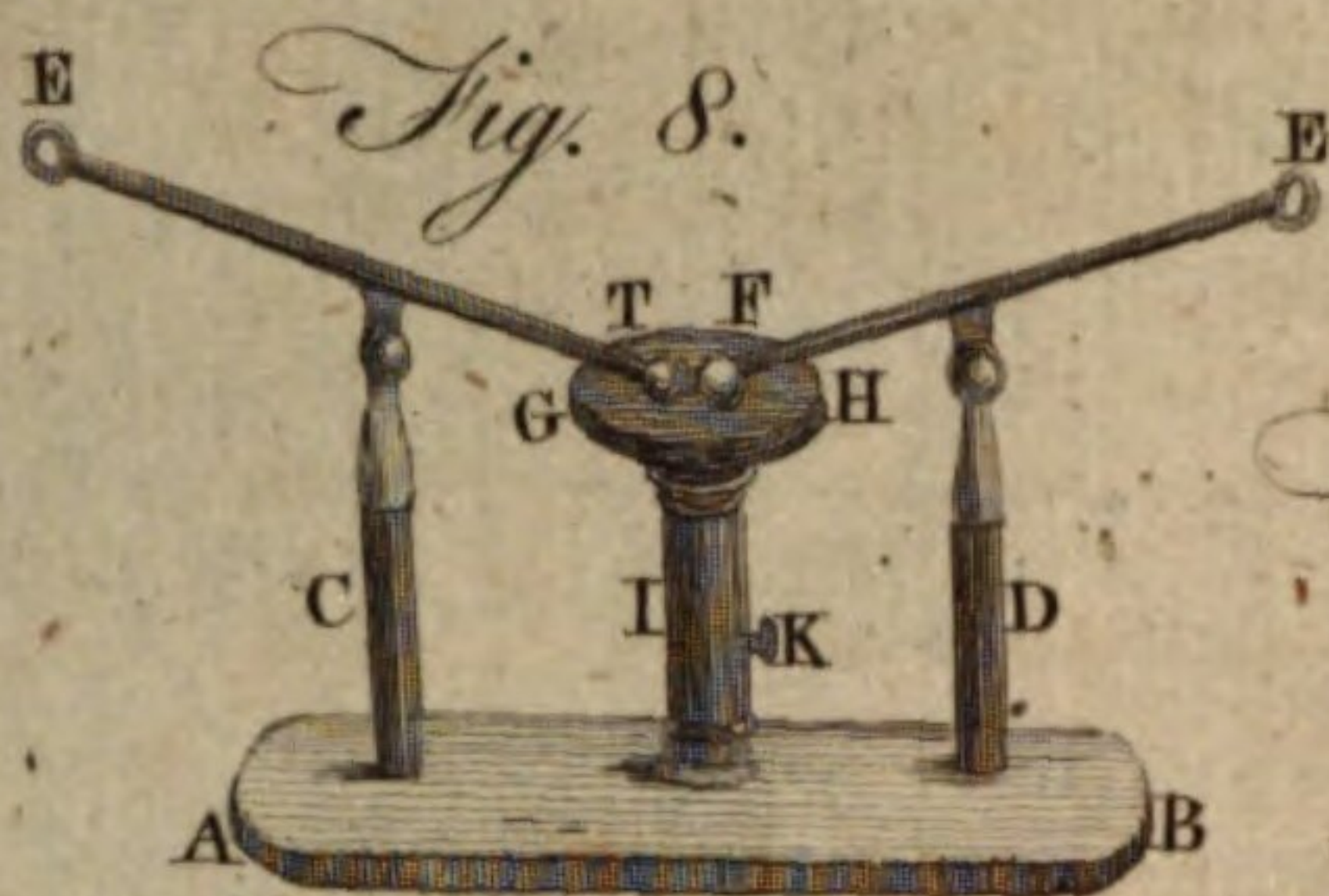
In all these machines the rubber is composed of a cushion stuffed with horse-hair or flannel, fastened to a board behind. It is covered with red Basil leather; and

from its under edge a piece of black Persian silk is glued, which goes over the cylinder as at *a*, fig. 5. to near the points of the collector fixed in the conductor. Thus a greater power of electricity is excited than what could have been done by the former machines. In them a piece of leather was fastened to the lower edge of the cushion, bearing against the cushion itself. To this piece of leather another of oiled silk was sewed, covering the cylinder as above described. In this way some of the amalgam above described was to be laid upon the piece of leather, and worked into its substance as much as possible; but in the present method nothing more is necessary than to hold an amalgamated piece of leather once or twice to the cylinder while turning. The rubber is fixed to a glass pillar *K* (fig. 5.) which is fastened into a wooden basis *L* at the bottom. This turns on an hinge; and by means of a screw at *M*, going through the basis to a fixed block on the frame, the pressure of the cushion may be augmented or diminished at pleasure; at the same time that it is rendered much more steady and uniform than by a flat sliding board and tightening screw as formerly used.

The glass pillar *K*, as well as all other glass pillars, the glass feet of insulating stools, &c. should be covered with varnish or rather sealing-wax; otherwise they will insulate very imperfectly on account of the moisture they attract from the air in damp weather. It was usual to support the rubber upon two springs screwed to its back, and which proceeded from the wooden cap of the pillar, in order to give way to and suit the inequalities of the glass; but by this contrivance the line of contact with the cylinder was not always the same, nor its pressure uniform, as already observed: but Mr William Jones has removed this difficulty by the bent spring represented fig. 1. It is fixed by a screw at *B*, and gives way by sliding notches at *a a*: its length and breadth are equal to that of the cushion, and its thickness proportional to the diameter and action of the cylinder upon it. In the machine above described, the rubber is well insulated, which is a great advantage when it is necessary to connect with the cushion a conductor, called the *negative conductor*; and when this happens not to be the case, which it usually is in making the common experiments, a chain with a small hook and ring may be hung to one end of the conductor, the other falling upon the table as in fig. 5.

The prime conductor belonging to this machine is represented by *N* in the same figure. It receives the electric fluid from the cylinder, and is usually made of brass or tin japanned. It is insulated by the glass pillar that supports it, and which is screwed into a wooden basis or foot. It is found more convenient to place the conductor parallel to the cylinder than with one of its ends towards it as was formerly done.

The handle of the wheel *A*, fig. 6. or the simple winch *I*, fig. 5. should be so turned, that the excited part of the cylinder may revolve from the rubber to the collecting points on the conductor; the prime conductor, standing then as in the figures, will be electrified positively, or overcharged with the electric fluid: for by the action of rubbing, the cylinder pumps, as it were, the fluid from the rubber, and every other body properly connected with it, and gives it to the prime



³³ Apparatus. prime conductor. But if negative electricity be required, the chain must be removed from the rubber, and hung to the prime conductor: for in this case, the electricity of the prime conductor will be communicated to the ground, and the rubber remaining insulated will appear strongly negative. If another conductor, equal in size to *N*, be connected with the rubber, as strong negative electricity may be obtained from the one as positive electricity from the other.

Fig. 6. represents an electrical machine with a conductor in the shape of a *T*; and an improved medical apparatus, where it is necessary to give the shock in the arms, will be more particularly explained afterwards, under the article *Medical ELECTRICITY*.

³⁴ Mr Nairn's patent machine. Fig. 7. shows Mr Nairn's patent electrical machine for medical purposes. Its principal parts are the glass cylinder, generally about 7 inches in diameter and 12 in length, with the two conductors parallel to it. It is furnished with wooden caps, and turns in two wooden pieces cemented on the top of two strong glass pillars *BB*. These pillars are made fast into the bottom board of the machine, which is fastened to the table by means of a crank. There are grooves made in the under part of the bottom of the crank, through which the pieces *FF* slide. On these pieces the pillars stand by which the two conductors are supported; and in order to place these conductors nearer to the cylinder, or remove them farther from it, the pieces on which they stand are moveable outwards or inwards, and may be fixed by the two screw-nuts *LL*. The rubber is fastened to the conductor *R*; and consists of a cushion of leather stuffed, having a piece of silk glued to its under part. This last being turned over the surface of the cushion, and thus interposed between it and the glass, goes over the cylinder, and almost touches the pointed wires which are fixed on the other conductors for the purpose of collecting the electric fluid from the cylinder. The conductors are of tin covered with black lacker, each of them containing a large coated glass jar, and likewise a smaller one, or a coated tube, which are visible when the caps *NN* are removed. To each conductor is fixed a knob *O*, for the occasional suspension of a chain to produce positive or negative electricity. That part of the winch *C* which acts as a lever in turning the cylinder, is of glass. Thus every part of the machine is insulated, the cylinder itself and its brass caps not excepted; by which means the least quantity possible of electric fluid is dissipated, and hence of course the effects are likely to be the more powerful. And to this the inventor has adapted some flexible conducting joints, a discharging electrometer, and other utensils necessary for the practice of medical electricity.

³⁵ Great machine at Teyler's museum. To these descriptions of electrical machines, we shall add that of a very large and powerful one in Teyler's Museum at Haarlem, and which was constructed by one Mr John Cuthbertson, an English mathematical instrument-maker. It consists of two circular plates of glass, each 65 inches in diameter, and made to turn upon the same horizontal axis, at the distance of $7\frac{1}{2}$ inches from one another. These plates are excited by eight rubbers, each $15\frac{1}{2}$ inches long. Both sides of the plates are covered with a resinous substance to the distance of $16\frac{1}{2}$ inches from the centre, both to render the plates stronger, and likewise to prevent any

of the electricity from being carried off by the axis. ³⁶ Apparatus. The prime conductor consists of several pieces, and is supported by three glass pillars 57 inches in length. The plates are made of French glass, as this is found to produce the greatest quantity of the electricity next to English flint, which could not be produced of sufficient size. The conductor is divided into branches which enter between the plates, but collect the fluid by means of points only from one side of the plate. The force of two men is required to work this machine; but when it is required to be put in action for any length of time, four are necessary. At its first construction nine batteries were applied to it, each having 15 jars, every one of which contained about a foot square of coated glass; so that the grand battery formed by the combination of all these contained 135 square feet. The effects of this machine were astonishing, as shall be mentioned in its proper place: but Dr Van Marum, who principally made experiments with it, imagining that it was still capable of charging an additional quantity of coated glass, afterwards added to it 90 jars of the same size with the former; so that it now contains a coated surface of 225 feet, and the effects are found to be proportionable.

We come now to describe some of the other parts of an electrical apparatus, and which, though not essentially necessary for exciting the property called *electricity*, are absolutely so for communicating it from one body to another, and performing many experiments which the machines themselves, however powerful, could not accomplish. Of these, the first we shall describe is that called the *discharger*; by which the electricity, whether positive or negative, collected upon one body, may be suddenly transferred from it to another; which is called *discharging* the electricity of the former, if only one body be perceptibly electrified; or of both, if the one contain positive and the other negative electricity.

Fig. 8. represents Mr Henley's universal discharger; Plate ³⁶ Discharger of electricity described. an instrument of very extensive use in forming communications between jars or directing the shock through any particular substance. *AB* is a flat board 15 inches long, 4 broad, and 1 thick, and forming the basis of the instrument. *DC* are two glass pillars cemented in two holes upon the board *AB*, and furnished at their tops with brass caps; each of which has a turning joint, and supports a spring tube, through which the wires *EF* and *ET* slide. Each of these caps is composed of three pieces of brass, connected with each other in such a manner, that the wire *EF*, besides its sliding through the socket, has two other motions, viz. an horizontal one and a vertical one. Each of the wires is furnished with an open ring at one end, and at the other has a brass ball; which, by a short spring socket, is slipped upon its pointed extremity, and may be removed from it at pleasure. *HG* is a strong circular piece of wood five inches diameter, having a slip of ivory inlaid on its surface, and furnished with a strong cylindric foot, which fits the cavity of the socket *I*. This socket is fixed in the middle of the bottom board, and has a screw at *K*; by which the foot of the circular board is made fast at any required height.

Fig. 9. is a small press belonging to this instrument. It consists of two oblong pieces of wood, which

Apparatus. which are forced together by the two screws *aa*. The lower end has a cylindrical foot equal to that of the circular table *H*. When this press is to be used, it must be fixed into the socket *I*, in place of the circular board *HG*; which in that case is to be removed.

37
Electrical
jar or Ley-
den phial.
Fig. 10. shows an electrical jar or Leyden vial, for the purposes chiefly of giving a shock, or of accumulating a quantity of electricity in such a manner as could not be done in any other way, without using an immense extent of electrified surface. It is coated on the inside with tin-foil to the height of about three inches below the top of the cylindrical part of the glass; and having a wire with a round brass knob at its extremity, which passes through the middle of a piece of wood *D*, is used as a stopper for the bottle. Its lower end is usually connected with the inside coating by means of a piece of chain or slender wire.

38
Electrical
battery.
Fig. 11. shows the most approved construction of an electrical battery; a part of the apparatus which takes its name from its construction and formidable effects. It consists of a number of coated jars, placed in such a manner that they may all be charged at the same time, and discharged in an instant; so that the whole power of electricity accumulated in them may be at once exerted upon the substance exposed to the shock. The battery represented in the figure consists of nine jars connected together by the wires *a, b, c, d, e, f, g, h, i*; all of which are fastened into the wood-stoppers of the bottles, and meet at top in the brass ball. Thus a communication is made between all the inside coatings of the jars, while their outside coatings are connected by the bottom of the box on which they stand; and which, that it may conduct the better, is covered with tin-foil. In one side of the box near the bottom is an hole through which a brass hook passes, and which communicates with the metallic lining of the box, and consequently with the outside coating of the jars. To this hook a wire or chain is occasionally connected when a discharge is made; and for the more convenient making of this discharge, a ball and wire *B* proceed to a convenient length from the centre ball *A*. When the whole force of the battery is not required, one, two, or three jars may be removed only by pressing down the wires belonging to them, until their extremities can slip out of their respective holes in the brass ball, and then turning them into such a posture that they cannot have any communication with the battery. The number of jars represented in this figure is rather small for some purposes; but it is better to join two or three small batteries together rather than have a single large one, which is inconvenient on account of its weight and unwieldiness.

The construction of jars and batteries is part of the business of an electrician; and he ought to be expert in coating the vials himself, not only because of the expence attending the employment of others, but because he may sometimes be at too great a distance from workmen who are accustomed to operations of this kind. A considerable difficulty arises with respect to the size of the jars and the kind of glass they are to be made of. Fine flint or crystal glass may probably be made use of with greater advantage than any other; but the expence here becomes a very considerable object, especially as the jars of a battery are

very apt to break by reason of the inequality of their strength; for it would seem that the force of the fluid in a battery is equally distributed among all the bottles, without any regard to their capacities of receiving a charge singly considered. Thus, if we express the quantity of charge which one jar can easily receive by the number 10, we ought not to combine such a jar in a battery with another whose capacity is only 8; because the whole force of electricity expressed by 10 will be directed also against that whose capacity is only 8; so that the latter will be in danger of being broken. It will be proper, therefore, to compare the bottles with one another in this respect before putting them together in a battery. Besides the consideration of the absolute capacity which each bottle has of receiving a charge, the time which is taken up in charging it must also be attended to; and the jars of a battery ought to be as equal as possible in this respect as well as in the former. The thinner a glass is, the more readily it receives a charge, and *vice versa*; but it doth not follow from thence, as electricians in general imagined till lately, that, on account of its thinness, it is capable of containing a greater charge than a thicker one. The reverse is actually the case: and though a thick glass cannot be charged in such a short time as a thin one, it is nevertheless capable of containing a greater power of electricity. If the thickness of the glass be very great, no charge can indeed be given it; but experiments have not yet determined how great the thickness must be which will prevent any charge. Indeed it is observed, that though a thick glass cannot be charged by a weak electric machine, it may be so by a more powerful one; whence it seems reasonable to suppose that there is no real limit of this kind; but that if machines could be made sufficiently powerful, glasses of any thickness might be charged. Mr Brookes, an ingenious electrician of Norwich, constructed his batteries, which appear to have been very powerful, of green-glass bottles. Some of them, like that represented in the figure, had only nine of these bottles; but when a greater power was wanted, more were added. Jars would have been preferred to bottles on account of their being more easily coated by reason of their wide mouths; but being less easily procured, he was content to put up with this inconvenience. The mean size of these bottles was about eight inches in diameter; they were coated 10 inches high, and made of the thickest and strongest glass that could be procured, weighing from five pounds and an half to seven pounds each. In the construction of a battery of 27 bottles, he disposed of them in three rows; nine of the stoutest and best composing the first row, nine of the next in strength being disposed of in the second, and the third containing the nine weakest. All of these were of green glass, but not of the same kind. Some which stood in the foremost row were composed of a kind very like that of which Frontinac wine-bottles are made: and our author remarks, that this kind of glass seems to be by much the best, as being both harder and stronger, and less liable to break by an high charge. The second and third rows of the battery consisted of bottles whose diameter was from six and an half to ten inches, and which were coated from eight and an half to eleven inches high; none of their mouths being larger than

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Why the
jars of a
battery are
sometimes
apt to
break.

40
Mr
Brookes's
method of
construct-
ing batte-
ries.

Apparatus. an inch and an half, nor less than three quarters of an inch. In case any of the bottles being broken by the discharge of the battery, Mr Brookes found that it could be mended in such a manner as to become serviceable by a cement made according to the following receipt: "Take of Spanish-white eight ounces; heat it very hot in an iron ladle, to evaporate all the moisture; and when cool, sift it through a lawn sieve: add three ounces of pitch, three quarters of an ounce of rosin, and half an ounce of bees-wax: heat them all together over a gentle fire, stirring the whole frequently for near an hour; then take it off the fire, and continue the stirring till it is cold and fit for use." The bottles cemented with this composition, however, were not judged to be sufficiently strong to stand in their original place, but were removed to the second or third row, as it was apprehended they could best sustain the charge. All the bottles of this battery, as well as the single ones he commonly made use of in his experiments, were coated both on the inside and outside with slips of tin-foil from three-eighths to three-fourths of an inch wide, laid on with paste of flour and water, at the distance of about the breadth of a slip between each.

Fig. 12. represents the insulating stool, a very useful part of the apparatus, especially for medical purposes, where it is often necessary to insulate the human body. In these cases it is proper to have it of a magnitude sufficient to hold a chair or other seat, on which the patient may sit during the operation. The stool itself may be conveniently constructed of a mahogany board with glass feet varnished, as already directed. When in use, the insulation will be the more perfect that a piece of dry paper be put upon it.

These are the parts of the electrical apparatus essentially necessary for exhibiting the ordinary experiments; but as many very curious phenomena are to be observed in different substances, without using any part of the apparatus above described, we shall next proceed to give an account of those bodies which naturally exhibit signs of electricity, with the various phenomena attending them.

SECT. IV. *A Catalogue of the different Electric Substances, with the general Phenomena attending their Excitation.*

THE list of substances by which electric phenomena may be produced, is so very extensive, that it may perhaps be doubted whether all terrestrial matters, metals and charcoal only excepted, may not be included in the number. Some, however, have the property much more, or exhibit particular phenomena more obviously, than others; and according to this we may divide them into classes, as shall afterwards be more particularly noticed. The following catalogues enumerate those in which the property in general has been discovered.

Cavalle's
Electricity,
p. 17.

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Catalogue
of electric
substances,
with their
different
powers.

Electric substances.	Quality of electricity.	Substances with which the electric is rubbed.
The back of a cat.	Positive	Every substance hitherto tried.
Smooth glass	Positive	Every substance, except the back of a cat.

Rough glass	Positive	Dry oiled silk, sulphur, or metals.	Phenomena.
	Negative	Woollen-cloth, quills, wood, paper, sealing-wax, white-wax, the human hand.	
Tourmalin	Positive	Amber, or air blown upon it.	
	Negative	Diamond, the human hand.	
Hare's skin	Positive	Metals, silk, loadstone, leather, hand, paper, baked wood.	
	Negative	Other finer furs.	
Black silk	Positive	Sealing-wax.	
	Negative	Hare's, weasel's, and ferret's skin, loadstone, brass, silver, iron, hand.	
White silk	Positive	Black silk, metals, black cloth.	
	Negative	Paper, hand, hare's, weasel's skin.	
Sealing-wax	Positive	Metals.	
	Negative	Hare's, weasel's, and ferret's skin, hand, leather, woollen-cloth, paper.	
Baked wood	Positive	Silk.	
	Negative	Flannel.	

This table contains most of those substances that exhibit the strongest marks of electricity. The following is composed by Mr Henley, and contains a great number of substances whose electricity is much more equivocal. They were fixed or tied on the end of a stick of sealing-wax; and excited by friction against a woollen garment, or a piece of soft black silk, by which means they became electrified as below. The strongest in power are distinguished by the letter s, and the weakest by the letter w.

METALS.

	Wool.	Silk.
A new guinea; a smooth sixpence; a brass ferule; tin, and tin-foil; enamelled copper, s; gilding on leather, s; lead ore; copper ore; iron ore; stream tin.	Neg.	Neg.
Milled lead; copper, s; a polished steel button, s; a new silver ditto; a metal button gilt, s; tutenague ditto, s; iron.	Pos.	Pos.
Lead from a tea-chest, in which there is a mixture of tin, w.	Neg.	Pos.
A gilt button, basket-pattern; the juncture at the end of a brass ferule.	Pos.	Neg.

ANIMAL SUBSTANCES.

Tortoise-shell, w; ivory, s; bone, s; horn; lamb's-tooth; horse's-hoof; deer's-hoof; muscle of the leg of a deer, s; cartilage, s; spur of a young cock; bill, claw, and scale from the leg of

of a turkey, s; scale of a carp; the *chrysalis* of a moth, recent from the earth, cleansed; *crassamentum* of the human blood exsiccated, w; quills; claw of an unboiled lobster; cowrie and several other smooth shells, s; shell of a hen's egg; tail of a small fish; thigh of the elephant beetle; a small beetle, smooth surface; human hair; red and white horse's and bullock's hair, s; hog's bristles, s; wool; silk from the worm, w; oyster-shell, smooth surface;

Mother of pearl, and several other shells.

Muscle and cockle-shells, recent; a recent snail-shell, rough surface; *elytra* of the stag-beetle; oyster-shell, rough surface.

VEGETABLES.

Rind of chestnut, s; Barcelona nut-shell, s; cashew nut, s; cocoa nut-shell polished; Brazil; *lignum vitae*; black ebony, s; box, w; cane, s; *quinquina*, or Peruvian bark, s; tamarind-stone; coffee-berry roasted, s; nutmeg, s; ginger, s; white pepper, freed from the husk, s; cinnamon, s; cloves, s; mace, s; all-spice, s; capsicum, both sides of the pod, s; hemlock, s; a clove of garlic; ditto of eschalot, freed from the husk, s; a green onion, s; rue, s; cork, s; leaves of laurel, bay, yew, holly, rosemary, with their berries, s; parsley, s; leaf of turnip; ditto of Savoy cabbage, s; celery, s; fago, s; thyme, s; carrot; turnip; potato; an acorn, s; rind of Seville orange, s; a large Windsor bean, s; a white pea; root of the white lily; snow-drop root; seeds of gourd, melon, cucumber, w; a species of long moss, w; an apple, s; down of the cotton-rush, w; sea-flag; leaf of the American aloe, s; cotton, w.

Hemp; flax; stalk of the tobacco-leaf; spike, from the leaf of the American aloe; *palma-christi* nut; horse-radish.

A white kidney-bean, smooth surface; black negroe of the same; scarlet of the same.

CORALLINES.

Sea-fan, the horny part, w; rough coral, w.

Spunge, w; coral polished, w.

SALTS.

Alum, w.

Borax,

Nitre purified,

Smooth surfaces;

FOSSIL and MINERAL SUBSTANCES.

Common pebble-stones of all colours, s; marble, s; pit-coal, s; black-
N^o III.

Wool. Silk.

Pos. Pos.

Neg. Pos.

Neg. Neg.

Neg. Neg.

Neg. Pos.

Pos. Pos.

Neg. Pos.

Neg. Pos.

Neg. Neg.

Pos. Pos.

lead, w; jet, s; *asbestos*; mineralized sulphur; thunder-bolt stone; *cornu ammonis*; shark's-tooth; coat of petrification.

Several smooth native crystals; brown Iceland ditto; *talc*, s; Ceylon pebble, smooth and transparent; agate, s; cornelian; amethyst, s.

A specimen of *gypsum*.

ARTIFICIAL SUBSTANCES.

Staffordshire ware glazed; China ware, s; Wedgwood's ware glazed, s; whale's fin prepared, w; writing-paper; parchment, s; sheep's gut.

Tobacco-pipe, s; Wedgwood's ware unglazed; elastic gum, s; hard under-crust of a leaf; a tallow-candle, w; oiled silk; painted paper, s; silver, burnt into glass, unburnished; pearl-barley, w; Indian ink, w; blue vitriol, s.

Dr Lewis's glass porcelain.

Here it must be observed, that a great number of the substances in Mr Henley's table, particularly metals, would have been totally incapable of excitation had they not been insulated; and as they were rubbed against electrics *per se*, it is by no means fair to conclude that the metal was excited. It seems much more likely that the rubber only was excited, and communicated its electricity to the metal. It must also be observed, that though there is a very remarkable difference between substances with regard to their non-electric or conducting power, yet there seems not to be a perfect electric in nature: for heat will destroy the electric power of glass, and every other substance; and, on the contrary, cold, if not attended with moisture, renders every electric substance more electric than before. The use of warming an electric therefore, before excitation, is only to free it from the moisture which may adhere to it.

From the above catalogues it will readily be apprehended, that the powers of the electric substances not only vary prodigiously from one another, but likewise according to the circumstances in which they are placed. Thus also we find, that, according to the different substances made use of, we may sometimes produce one phenomenon and sometimes another, in a manner exclusive of all the rest. Hence we have a foundation for classing electric substances according to the various powers they occasionally exhibit, and which we shall do in the following manner.

1. Those which exhibit a strong and permanent attractive and repulsive power; of which the most remarkable is silk.

2. For exhibiting the electric light, attraction and repulsion, and all the other phenomena of electricity in a very vigorous though not durable manner, glass is preferable to all other bodies.

3. Those which exhibit electric appearances for a great length of time, and which communicate to conducting bodies the greatest electric power. Of these the substances called *negative electrics* are the most remarkable;

Wool. Silk. Pheno-
mena.

Neg. Neg.

Pos. Pos.

Neg. Pos.

Pos. Pos.

Neg. Neg.

Neg. Pos.

Pheno-
mena. markable; such as amber, gum-lac, rosin, sulphur, &c. on the properties of which depend the phenomena of the electrophorus, to be afterwards described.

4. Those which readily exhibit electrical phenomena by heating and cooling, of which the principal is the tourmalin.

§ 1. *Of the Electrical Phenomena from Silk.*

* See
n° 5. THIS substance was first discovered to be an electric by Mr Grey, in the manner we have already related*; but as it was by no means remarkable for emitting sparks, which most commonly engages the attention, its electric virtues were almost entirely overlooked till the year 1759. At that time Mr Symmer presented to the royal society some papers, containing a number of very curious experiments made with silk stockings, in substance as follows.

He had been accustomed to wear two pairs of silk stockings; a black and a white. When these were put off both together, no signs of electricity appeared; but on pulling off the black ones from the white, he heard a snapping or crackling noise, and in the dark perceived sparks of fire between them. To produce this and the following appearances in great perfection, it was only necessary to draw his hand several times backward and forward over his leg with the stockings upon it.

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Strong at-
traction and
repulsion
between e-
lectrified
stockings. When the stockings were separated and held at a distance from each other, both of them appeared to be highly excited; the white stocking positively, and the black negatively. While they were kept at a distance from each other, both of them appeared inflated to such a degree, that they exhibited the entire shape of the leg. When two black or two white stockings were held in one hand, they would repel one another with considerable force, making an angle seemingly of 30 or 35 degrees. When a white and black stocking were presented to each other, they were mutually attracted; and if permitted, would rush together with surprising violence. As they approached, the inflation gradually subsided, and their attraction of foreign objects diminished, but their attraction of one another increased; when they actually met, they became flat, and joined close together like as many folds of silk. When separated again, their electric virtue did not seem to be in the least impaired for having once met; and the same appearances would be exhibited by them for a considerable time. When the experiment was made with two black stockings in one hand, and two white ones in the other, they were thrown into a strange agitation, owing to the attraction between those of different colours, and the repulsion between those of the same colour. This mixture of attractions and repulsions made the stockings catch at each other at greater distances than otherwise they would have done, and afforded a very curious spectacle.

When the stockings were suffered to meet, they stuck together with considerable force. At first Mr Symmer found they required from one to 12 ounces to separate them. Another time they raised 17 ounces, which was 20 times the weight of the stocking that supported them; and this in a direction parallel to its surface. When one of the stockings was turned inside out, and put within the other, it required 20 ounces to separate them; though at that time 10 ounces were sufficient when applied externally. Getting the black

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Pheno-
mena. stockings new dyed, and the white ones washed, and whitened in the fumes of sulphur, and then putting them one within the other, with the rough sides together, it required three pounds three ounces to separate them. With stockings of a more substantial make, the cohesion was still greater. When the white stocking was put within the black one, so that the outside of the white was contiguous to the inside of the black, they raised nine pounds wanting a few ounces; and when the two rough surfaces were contiguous, they raised 15 pounds one pennyweight and a half. Cutting off the ends of the thread and the tufts of silk which had been left in the inside of the stockings, was found to be very unfavourable to these experiments.

Mr Symmer also observed, that pieces of white and black silk, when highly electrified, not only cohered with each other, but would also adhere to bodies with broad and even polished surfaces, though these bodies were not electrified. This he discovered accidentally; having, without design, thrown a stocking out of his hand, which stuck to the paper-hangings of the room. He repeated the experiment, and found it would continue hanging near an hour. Having stuck up the black and white stockings in this manner, he came with another pair highly electrified; and applying the white to the black, and the black to the white, he carried them off from the wall, each of them hanging to that which had been brought to it. The same experiments held with the painted boards of the room, and likewise with the looking-glasses, to the smooth surface of which both the white and the black silk appeared to adhere more tenaciously than to either of the former.

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Similar experiments, but with a greater variety of Experi-
ments on
circumstances, were afterwards made by Mr Cigna of ribbons by
Turin, upon white and black ribbons. He took two Mr Cigna.
white silk ribbons just dried at the fire, and extended them upon a smooth plain, whether a conducting or electric substance was a matter of indifference. He then drew over them the sharp edge of an ivory ruler, and found that both ribbons had acquired electricity enough to adhere to the plain; though while they continued there, they showed no other sign of it. When taken up separately, they were both negatively electrified, and would repel each other. In their separation, electric sparks were perceived between them; but when again put on the plain, or forced together, no light was perceived without another friction. When by the operation just now mentioned they had acquired the negative electricity, if they were placed, not upon the smooth body on which they had been rubbed, but on a rough conducting substance, they would, on their separation, show contrary electricities, which would again disappear on their being joined together. If they had been made to repel each other, and were afterwards forced together, and placed on the rough surface above mentioned, they would in a few minutes be mutually attracted; the lowermost being positively, and the uppermost negatively electrified.

If the two white ribbons received their friction upon the rough surface, they always acquired contrary electricities. The upper one was negatively, and the lower one positively electrified, in whatever manner they were taken off. The same change was instantaneously done by any pointed conductor. If two ribbons, for instance, were made to repel, and the point

Pheno-
mena.

of a needle drawn opposite to one of them along its whole length, they would immediately rush together.

The same means which produced a change of electricity in a ribbon already electrified, would communicate electricity to one which had not as yet received it; viz. laying the unelectrified ribbon upon a rough surface, and putting the other upon it; or by holding it parallel to an electrified ribbon, and presenting a pointed conductor to it. He placed a ribbon that was not quite dry under another that was well dried at the fire, upon a smooth plain; and when he had given them the usual friction with his ruler, he found, that in what manner soever they were removed from the plain, the upper one was negatively and the lower one positively electrified.—If both ribbons were black, all these experiments succeeded in the same manner as with the white. If, instead of the ivory ruler, he made use of any skin, or a piece of smooth glass, the event was the same; but if he made use of a stick of sulphur, the electricities were in all cases the reverse of what they had been before the ribbons were rubbed, having always acquired the positive electricity. When he rubbed them with paper either gilt or not gilt, the results were uncertain. When the ribbons were wrapped in paper gilt or not gilt, and the friction was made upon the paper laid on the plain above mentioned, the ribbons acquired both of them the negative electricity. If the ribbons were one black and the other white, whichever of them was laid uppermost, and in whatever manner the friction was made, the black generally acquired the negative and the white the positive electricity.

He also observed, that when the texture of the upper piece of silk was loose, yielding, and retiform like that of a stocking, so that it could move and be rubbed against the lower one, and the rubber was of such a nature as could communicate but little electricity to glass, the electricity which the upper piece of silk acquired did not depend upon the rubber, but upon the body on which it was laid. In this case, the black was always negative and the white positive. But when the silk was hard, rigid, and of a close texture, and the rubber of such a nature as would have imparted a great degree of electricity to glass, the electricity of the upper piece depended on the rubber. Thus, a white silk stocking rubbed with gilt paper upon glass became negatively, and the glass positively, electrified. But if a piece of silk of a firmer texture was laid upon a plate of glass, it was *always* electrified positively, and the glass negatively, if it was rubbed with sulphur, and for the most part if it was rubbed with gilt paper.

If an electrified ribbon was brought near an insulated plate of lead, it was attracted, but very feebly. On bringing the finger near the lead, a spark was observed between them, the ribbon was vigorously attracted, and both together showed no signs of electricity. On the separation of the ribbon, they were again electrified, and a spark was perceived between the plate and the finger.

When a number of ribbons of the same colour were laid upon a smooth conducting substance, and the ruler was drawn over them, he found, that when they were taken up singly, each of them gave sparks at the place where it was separated from the other, as did also the

last one with the conductor; and all of them were negatively electrified. If they were all taken from the plate together, they cohered in one mass, which was negatively electrified on both sides. If they were laid upon the rough conductor, and then separated singly, beginning with the lowermost, sparks appeared as before, but all the ribbons were electrified positively, except the uppermost.—If they received the friction upon the rough conductor, and were all taken up at once, all the intermediate ribbons acquired the electricity, either of the highest or lowest, according as the separation was begun with the highest or the lowest. If two ribbons were separated from the bundle at the same time, they clung together, and in that state showed no sign of electricity, as one of them alone would have done. When they were separated, the outermost one had acquired an electricity opposite to that of the bundle, but much weaker.

A number of ribbons were placed upon a plate of metal to which electricity was communicated by means of a glass globe, and a pointed conductor held to the other side of the ribbons. The consequence was, that all of them became possessed of the electricity opposite to that of the plate, or of the same, according as they were taken off; except the most remote, which always kept an electricity opposite to that of the plate.

§ 2. Of the Phenomena produced by excited or electrified Glass.

THAT glass is an electric substance, was first discovered by Dr Gilbert. It was for a long time, however, thought to possess but a very weak electric virtue; though now it is found to be one of the best, if not the very best, electric as yet known. Notwithstanding the many experiments made upon this substance, it is not yet ascertained what kind of glass is most proper for electrical purposes. It has been observed, that the hardest and most completely vitrified glass is often a very bad electric, being sometimes quite a conductor. Glass vessels made for electrical purposes are often rendered fit for them by use and time, though very bad electrics when new. Mr Bergman of Upsal says, that very often, when his glass globes could not be excited to a sufficient degree of strength, he lined them with a thin coating of sulphur, and that then they gave a much stronger positive electricity than before. In Italy, and other places, according to Mr Nollet, it is the custom of electricians to put a coating of pitch or other resinous matter on the inside of their globes, which they say always makes them work well. He gives the preference to the crystal glass of England, Bohemia, &c. It seems doubtful, however, whether the common bottle glass does not answer equally well, or even better.

The most remarkable phenomenon producible by excited glass is that of the Leyden vial. It depends entirely upon the following property of glass, viz. that it is impossible to electrify the outside of a glass positively, at least to any considerable degree, without at the same time electrifying the inside of it negatively: in like manner, it is impossible to electrify the outside negatively; without at the same time electrifying the inside positively. It is also the nature of glass and all other electric substances, when once electrified either by excitation or communication,

Pheno-
mena.

45
All kinds
of glass not
equally pro-
per for elec-
tric experi-
ments.

46
Leyden vial
explained.

Pheno-
mena.

munication, to part with their electricity very slowly and gradually. Thus, supposing a tube, cylinder, or plate of glass, to be highly electrified; if a finger is brought near any part of it, a spark will be felt to strike the finger with a snapping noise. Part of the electricity will then be discharged from the glass, but not all. If the finger is brought near another part of the glass, a similar spark will be again produced; and so on, by moving the finger to different parts of the glass, till all its electricity is exhausted. It is the nature of conducting substances to discharge all their electricity at once, by a single spark, if another conducting substance is brought near them. This being the case, therefore, it follows, that if every part of one side of a glass plate is covered over with a conducting substance, every point of the glass will give out its electricity to the conductor; and consequently, if another conducting substance is brought near to that by which the glass is covered, the whole electric power in the glass ought to be discharged in one single flash or large spark.

This would no doubt be the case, if it was possible to electrify the glass only on one side. But this is found to be impossible. No method hath yet been found of electrifying one side of a piece of glass positively, without electrifying the other negatively at the same time. There is therefore a necessity for taking off the electricity from both sides of the glass at the same time. This can only be done by covering both sides of the glass with a conducting substance, and presenting other conductors to both sides at the same time: then the electricity of both is discharged in an instant. A strong spark is perceived between both sides of the coated glass and the conducting substances; and if a person holds one in each hand, he will, at the instant of the discharge, feel a very disagreeable sensation, which cannot well be described, in his arms and breast: and this is said to be receiving the *electric shock*.

If, instead of presenting a conducting substance to both sides of the plate at once, a finger is presented to one side, suppose that which is positively electrified, and another substance very highly electrified positively is presented to the negative side of the glass, a like discharge will ensue, but the shock will be much gentler than in the former case, and probably the electricity of the glass will not be all discharged. If two conducting substances, insulated, suppose two cylinders of metal fixed upon sticks of sealing wax, or suspended by silk threads, are brought to the sides of the coated glass at the same time; each of them will receive a spark of positive or negative electricity, according as the side to which it was applied is positively or negatively electrified. When the metallic cylinders are taken away, they will communicate the electricity they have received to other bodies; and if again applied to the coated glass, they will receive sparks as before; and thus the electricity of both sides will be gradually discharged.

After the discharge has been once made, the glass is found in a short time to recover its electricity, tho' in a small degree. The side which was originally electrified positively, becomes electrified in the same manner the second time, and so of the negative side. This second electrification is called the *residuum* of a charge; and, where there is a large surface of coated glass, hath a very considerable degree of power. The same thing,

which we have just now observed with regard to a flat surface of glass, takes place with tubes and vials, or glass vessels of any kind; and it is always observed, that the thinnest glass answers best for this purpose. The Leyden vial consists of a glass vial, jar, or bottle, covered on the outside and inside with tin-foil, yet leaving an interval of two or three inches at top without any metallic covering, that the electricity of the one side may not be communicated to the other as fast as it is collected. A more particular description of it will be given when we speak of the electric apparatus. The above will be sufficient to render the following experiments intelligible.

Mr Symmer, when making the experiments we have already related, concerning the strong cohesive power of electrified silk, was induced to try the cohesive power of electrified glass. For this purpose, he got two panes of common window-glass, the thinnest and smoothest he could meet with. He coated one of the sides with tin-foil, leaving a space uncovered near the edges. The uncovered sides were then put together, and electricity communicated to one of the coatings by means of a machine. In consequence of this, the other side, which was also coated, became electrified with an electricity opposite to the first, and both panes were charged with the electric power, as if they had been but one. After they had received a considerable degree of electric power, they cohered pretty strongly together, but he had no apparatus by which the strength of their cohesion could be measured. He then turned the plates upside down; and discharging from his machine positive electricity upon the negative side of the glass, both panes were immediately discharged, and their cohesion ceased. Placing two panes of glass, each of them coated on both sides, one upon the other, each of them had a positive and negative side, by communicating electricity to one of them, and they did not cohere.

In consequence of these experiments made by Mr Symmer, and another (which we shall presently give an account of) made at Pekin, Mr Beccaria made the following ones. Having charged a coated plate of glass, he took off the coating from the negative side, and applied another uncoated and uncharged (or un-electrified) plate of glass close to it. After this, putting a coating upon the uncharged glass (so that the whole resembled one coated plate consisting of two laminæ), he made a communication between the two coatings. The consequence of this was an explosion, a discharge of the positive and negative electricity, and a cohesion of the plates. If the plates were separated before the explosion, after they had been in conjunction for some time, the charged plate was positive on both sides, and the uncharged one negative on both sides. If after the explosion he separated and joined them alternately, a small circle of paper, placed under the uncharged plate, adhered to it upon every separation, and was thrown off again upon every conjunction. This could be repeated even 500 times with once charging the plate. This is the experiment made at Pekin as above mentioned.

If, in these experiments, the charged plate was inverted, and the positive side applied to the uncharged plate, all the effects were exactly the reverse of the former. If it was inverted ever so often, after remain-

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Experiments on
glass plates
by Mr
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Experiments on
glass plates
by Mr Beccaria.

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ing some time in contact with the uncharged plate, it would produce a change in the electricity. In the dark, a light was always seen upon the separation of these plates. Laying the two plates together like one, and coating the outsides of them, he discharged them both together; and at the distance of about four feet he distinguished six of the coloured rings mentioned by Sir Isaac Newton, all parallel to one another, and nearly parallel to the edge of the coating. At the angles of the coatings the rings spread to a greater distance. Where the coatings did not quite touch the glass, the rings bent inwards; and where the coatings adhered very close, they retired farther from them. Upon discharging these two plates, the coloured rings vanished, and the electric cohesion ceased with them. On separating the plates before the explosion; that which had received the positive electricity was positive on both sides, and the other negative on both sides. If they were separated after the explosion, each of them was affected in a manner quite the reverse. Upon inverting the plates, that which was the thinner appeared to be possessed of the stronger electricity, and brought the other plate to correspond with it. Charging the two plates separately, and taking off two of the coatings, so that two positive or two negative sides might be placed together, there was no cohesion nor explosion. But joining a positive and a negative side, they immediately cohered; and a communication being formed on the outside, there was an explosion which increased the cohesion.

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By Mr
Henley.

Mr Henley repeated these experiments with success when he made use of plates of looking-glass, or window and crown glass; but when two plates of Nuremberg glass, commonly called *Dutch plates*, were used, the result was very different. Each of the plates, when separated after charging, had a positive and a negative surface. When they were replaced, and a discharge made, by forming a communication between the two coatings, the electricity of all the surfaces was changed. It appeared, however, still to be very strong, and the plates continued to give repeated flashes of light when they were alternately closed, touched, and separated, like the other plates above-mentioned. If a clean, dry, uncoated plate of looking-glass was placed between the coated plates, either of looking-glass or crown-glass, before they were charged, that uncoated plate was always found, upon separating them after charging, to be electrified negatively on both sides; but if it was put between the Dutch plates, it acquired, like them, a positive and negative electricity.

The following observation of Mr Æpinus is very remarkable. He pressed close together two pieces of looking-glass, each containing some square inches; and found, that when they were separated, and not suffered to communicate with any conductor, they acquired a strong electricity, the one positive and the other negative. When put together again, the electricity of both disappeared; but not if either of them had been deprived of their electricity when they were asunder; for in that case, the two, when united, had the electricity of the other.

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Conducting
power of
glass tubes.

These are the most remarkable experiments that have been made with electrified flat plates of glass. Tubes

of the same matter, however, afford a variety of curious phenomena of a different nature. One very remarkable one is the conducting power of new flint-glass, which is most easily perceived in tubes, and on which Dr Priestley makes the following observations. He several times got tubes made two or three yards long, terminating in solid rods. These he took almost warm from the furnace, in the finest weather possible; and having immediately insulated them, perceived that the electricity of a charged vial would presently diffuse itself from one end to the other; and this he thought would have been the case at any distance at which the experiment could have been made. When the same tubes were a few months older, the electricity could not be diffused along their surface farther than half a yard.

The diffusive power of glass he thought proper to try in a different manner. A tube was procured of about three feet long, but of very unequal width. About three inches of the middle part of it were coated on both sides. This coated part was afterwards charged, by communicating electricity to the inside of it by means of a wire. The consequence of this was, that not only the part through which the wire was introduced became strongly electrical on the outside, but at the opposite end, where there was neither coating nor wire, the fire crackled under the fingers as the tube was drawn through the hand, and a flame seemed continually to issue out at both ends, while it was at rest and charged. — One end of this tube was broken and rough, the other was smooth.

Another tube was procured about three feet and an half in length, and very thin. It was about an inch in diameter, and closed at one end. Three inches of it were coated on both sides, about nine inches below the mouth. This part being charged, the whole tube, to the very extremity of it, was strongly electrical, crackling very loud when the hand was drawn along it, and emitting sparks at about an inch distance all the way. After drawing the whole tube through the hand, all the electricity on the outside was discharged; but, on putting a finger into the mouth, a light streamed from the coating, both towards the finger and towards the opposite end of the tube. After this, all the outside of the tube was become strongly electrical as before; and this electricity might be taken off and recovered many times without charging the tube anew, only it was weaker each time. — Holding this tube by the coated part, and communicating electricity to the uncoated outside, both sides became charged; and, upon introducing a wire, a considerable explosion was made. The discharge made the outside strongly electrical, and by taking off this electricity, the tube became sensibly charged. The residuum of these charges was very considerable; and, in one tube, there was a residuum after 20 or 30 discharges.

By being kept for six or seven months, most of the tubes employed in these experiments lost the above-mentioned properties, and the electricity could no longer diffuse itself upon their surfaces. At length they were all broken except one, which had been the most remarkable of the whole. With this old tube, the Doctor tried to repeat the above-mentioned experiments;

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ments; but to no purpose. He then took it to a glass-house; and having made it red all over, its diffusive property was restored as before.

He then tried two other tubes which had been made about six weeks, but without being used during all that time, and they answered exactly as if they had been quite new. The charge from a small coated part diffused itself all over the tube; so that, at the distance of a yard from the coating, it gave sparks to the finger of an inch long. On this occasion he observed, that when his finger was brought to the tube about two inches above the coating, a great quantity of the diffusing electricity was discharged; and his whole arm was violently shocked. The old tube, after being heated as above mentioned, showed a prodigious diffusive power. Upon charging a small coated part, the electricity was diffused to the end of the tube; and it gave sparks at the distance of an inch over every part of it. When it was drawn through the hand, in order to take off the diffused electricity, it instantly returned again, and the extremity of the tube would be highly electrified, even while its communication with the coating was cut off by the hand. The middle part of the tube also, which had been oftenest heated, had a much greater diffusive power than any other. It was no sooner taken off, than it appeared again; so that it gave a continual stream of fire. The quantity of residuum after a discharge of this tube was prodigious; so that the outside coating would immediately after give almost a constant stream of fire for some time to any conducting substance placed near it.

The Doctor also observed, that in all the tubes which had the diffusion, there was a considerable noise at the orifice when his hand was drawn from the extremity towards the coating, as if the tube had been gradually discharging itself. In the dark, the electric matter seemed perpetually to pour from the open end, or both ends if they were open; and whenever his hand was drawn over it, the fire streamed from the coating to his hand in a very beautiful manner. The first time he charged any of these tubes after they had stood a while, the diffusion was the most remarkable. It was lessened by every successive charge, and at last became exceedingly small; but after the tube had stood a few hours uncharged, it was as vigorous as ever.

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Cavallo's
experiments with
glass tubes.

Mr Cavallo hath also made some curious discoveries concerning glass-tubes. He took the hint from observing accidentally, that by agitating quicksilver in a glass tube hermetically sealed, and in whose cavity the air was very much rarefied, the outside of the tube was sensibly electrified. The electricity, however, was not constant, nor in proportion to the agitation of the quicksilver. In order to ascertain the properties of these tubes, he constructed several of them, one of which is represented fig. 71. Its length was 31 inches, and its diameter something less than half an inch. The quicksilver contained in it was about three fourths of an ounce; and in order to exhaust it of air, one end of it was closed, while the quicksilver boiled in the other. Before this tube is used, it must be made a little warm and cleaned; then, holding it nearly horizontal, the quicksilver in it is suffered to run from one end to the other, by gently and alternately elevating and depressing its extremities. This operation immediately renders the outside electrical; but with the

Plate
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following remarkable property, viz. that the end of the tube where the quicksilver actually stands is always positive, and all the remaining part of it negative. If elevating this positive end of the tube a little, the quicksilver runs to the opposite end which was negative, then the former instantly becomes negative, and the latter positive. The positive end has always a stronger electricity than the negative. If when one end of the tube, for instance *A*, is positive, i. e. when the quicksilver is in it, that electricity is not taken off by touching it; then, on elevating this end *A*, so that the quicksilver may run to the opposite end *B*, it appears negatively electrified in a very small degree. If by depressing it again it is a second time rendered positive, and that positive electricity is not taken off, then, on elevating the end *A* again, it appears positive in a small degree. But if, whilst it is positive, its electricity is taken off, then on being elevated, it appears strongly negative. When about two inches of each extremity of this tube is coated with tin-foil, as represented in the figure, that coating renders the electricities at the extremities more perceptible, so that sometimes they will give sparks to a conductor brought near them. Tubes whose glass is about one-twentieth of an inch thick answer better for these experiments than any others.

We shall close this account of the phenomena of excited glass, with some experiments which show the durability of the electric virtue in that substance in certain circumstances. Mr Canton procured some thin glass balls of about an inch and a half in diameter, with stems or tubes of eight or nine inches in length. He electrified them, some positively, and others negatively, on the inside, and then sealed them hermetically. Soon after, he found that they had lost all signs of electricity: but holding them to the fire at the distance of five or six inches, they became strongly electrical in a short time, and more so as they cooled. Heating them frequently he found would diminish their power; but keeping one of them under water a week did not appear in the least to impair it. That which he kept under water was charged on the 22d of September 1760, was heated several times before it was kept in water, and had been frequently heated afterwards; yet it still retained its virtue to a considerable degree till the 31st of October following. The breaking of two of his balls gave him an opportunity of observing their thickness, which he found to be between seven and eight parts of a thousand of an inch. The balls retained their virtue for six years, but in a less degree. Mr Lullin also found, that a glass tube charged and hermetically sealed, would show signs of electricity when heated.

The most remarkable instances of the continuance of this power in glass, however, are those given by Mr Henly in the 67th volume of the Phil. Trans. One is, of a small bottle, which showed signs of electricity for 70 days after it had been charged, and stood in a cupboard all that time. The other is of a glass cylinder, which after excitation continued to show very strong signs of electricity from the 5th day of February to the 10th of March, though various methods had been used during that time to destroy the electric virtue. These means always proved effectual when they were applied, and the cylinder for some time showed

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Durability
of the elec-
tric virtue
in glass.

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showed no signs of electricity. They never failed, however, to return without any fresh excitation; and became stronger and weaker, nay, sometimes quite vanished and returned, without any visible cause. In general, the electricity was weak when a fire was kept in the room, or when the door was kept open. When the wind blew from the north, the electricity was vigorous, and likewise after it had been for some time destroyed by flame. The cylinder, however, did not at all times retain its electric virtue for such a length of time without excitation. Very often it would lose all signs of electricity in 12 hours, and at other times in a fortnight, without returning till it was again excited.

§ 3. *The Phenomena of excited Sulphur, Gum-lac, Amber, Rosin, baked Wood, &c.*

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Experiments by
Mr Wilcke,
Æpinus,
&c.

THE most remarkable property of these, as already mentioned, is the durability of their electric virtue when once excited. They are also capable of being excited by heat without any friction. This last property was discovered by Mr Wilcke, who distinguishes it by the name of *spontaneous electricity*. He melted sulphur in an earthen vessel, which he placed upon conductors: then, letting them cool, he took out the sulphur, and found it strongly electrical; but it was not so when it stood to cool upon electric substances. He then melted sulphur in glass vessels, whereby they both acquired a strong electricity whether placed upon electrics or not; but a stronger in the former case than in the latter: they acquired a stronger virtue still, if the glass vessel was coated with metal. In these cases, the glass was always positive and the sulphur negative. It was particularly remarkable, that the sulphur acquired no electricity till it began to cool and contract, and was the strongest in the greatest state of contraction; whereas the electricity of the glass was, at the same time, the weakest; and was the strongest of all when the sulphur was shaken out before it began to contract, and acquired any negative electricity.

Pursuing experiments of this kind, he found, that melted sealing-wax poured into glass acquired a negative electricity, but poured into sulphur a positive one, leaving the sulphur negative. Sealing-wax also, poured into wood, was negative, and the wood positive; but sulphur poured into sulphur, or into rough glass, acquired no electricity at all.

Similar experiments were also made by Mr Æpinus. He poured melted sulphur into metal cups; and observed, that, when the sulphur was cold, the cup and sulphur together showed no signs of electricity, but very strong signs of it the moment they were separated. The electricity always disappeared when the sulphur was replaced in the cup, and revived upon its being taken out. The cup had acquired a negative, and the sulphur a positive electricity; but if the electricity of either of them had been taken off while they were separate, they would both, when united, show signs of that electricity which had not been taken off.

Mr Wilcke also made several curious experiments concerning the effects of different rubbers upon electric substances, the most remarkable of which is the following: viz. that sulphur rubbed against metals was

always positive; and this was the only case in which it was so. But, being rubbed against lead, it became negative, and the metal positive.

With regard to the perpetual attractive power of sulphur, &c. which Mr Grey fancied he had discovered*, the most remarkable example he gives is of a large cone of stone sulphur, covered with a drinking glass in which it was made. This he said would never fail to show an attractive power when the glass was taken off. In fair weather, the glass would attract also; but not so strongly as the sulphur, which never failed to attract, let the wind or weather be ever so variable. This experiment has been repeated by Mr Henly; who says he has never known the sulphur to fail of showing signs of electricity on the removal of the glass. Gum-lac, rosin, &c. agree in the same general properties with sulphur, but do not become so strongly electrified spontaneously, nor are they so easily excited.

Phenomena.

* See n° 6.

§ 4. *Phenomena of the Tourmalin.*

THESE have been accurately observed by Dr Priestley, who gives the following account of the methods he made use of for that purpose.

1. To ascertain the kind of electricity produced, he had always at hand a stand of baked wood with four arms projecting from it. Three of these were of glass, having threads of fine silk as it comes from the worm fastened to them, and at the end of each thread a small piece of down. From the other arm hung a fine thread about 9 or 10 inches long, while a brass arm suspended a pair of pith-balls. At the other extremity of this arm, which was pointed, a jar could be placed, to receive the electricity, and by the repulsive power of it keep the balls equally diverging with positive or negative electricity; or sometimes he suspended the balls in an uninsulated state within the influence of large charged jars: and lastly, he had always a fine thread of trial at hand, by which he could discover whether the stone was electrical or not before he began his experiments.

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Dr Priestley's method of observing its electricity.

2. Before he began any experiments on the stone, also, he never failed to try how long the fine threads, which he used as electrometers, would retain their virtue; and found this to be various in various cases. When the threads would retain their electric virtue for a few minutes, he preferred them; but when this was not the case, he had recourse to the feathers, which never failed to retain it for several hours. They might be touched without any sensible loss of power, though they received their virtue very slowly. In the experiments now to be related, he made use of Dr Heberden's large tourmalin, whose convex side became positive and the flat side negative in cooling; and in all of them, when the positive or negative side of the tourmalin is mentioned, it is to be understood that which is positive or negative in cooling.

3. From Mr Wilcke's experiments on the production of spontaneous electricity, by melting one substance within another, he first conjectured that the tourmalin might collect its electricity from the neighbouring air: To determine which the following experiment was made. Part of a pane of glass was laid on the standard bar of an excellent pyrometer, and upon that glass the tourmalin was placed. This bar was heated

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heated by a spirit lamp, so that the increase or decrease of heat in the tourmalin could thus be exactly determined. In this situation he observed, that whenever he examined the tourmalin, the glass had acquired an electricity contrary to that side of the stone which lay upon it, and equally strong with it. If, for example, the flat side of the stone had been presented to a feather electrified positively, as the heat was increasing, it would repel it at the distance of about two inches, and the glass would attract it at the same or a greater distance; and when the heat was decreasing, the stone would attract, and the glass repel it at the distance of four or five inches. The case was the same whichever of the sides was presented, as well as when a shilling was fastened with sealing-wax upon the glass; the electricity both of the shilling and glass being always opposite to that of the stone. When it came to the turn, the electricity was very quickly reversed; so that in less than a minute the electricity would be contrary to what it was before. In some cases, however, viz. where the convex surface of the tourmalin was laid upon the glass or shilling, both of these became positive as well as the stone. This he supposed to be owing to the stone touching the surface on which it lay only in a few points, and that its electricity was collected from the air; which supposition was verified: for, getting a mould of Paris plaster made for the tourmalin, and heating it in the mould, fastened to a slip of glass, he always found the mould and glass possessed of an electricity contrary to that of the stone, and equally strong with it. During the time of cooling, the mould seemed to be sometimes more strongly negative than the stone was positive; for once, when the stone repelled the thread at the distance of three inches, the mould attracted it at the distance of near six (A).

4. On substituting another tourmalin instead of the piece of glass; it was observed, that when one of the tourmalins was heated, both of them were electrified as much as the tourmalin and glass had been. If the negative side of a hot tourmalin was laid upon the negative side of a cold one, the latter became positive, as would have been the case with a piece of glass. On heating both the tourmalins, though fastened together by cement, they acquired the same power that they would have done in the open air.

5. As the tourmalins could not in this case touch in a sufficient number of points, it was now thought proper to vary the experiment by cooling the tourmalin in contact with sealing-wax, which would fit it with the utmost exactness. On turning the stone, when cold, out of its waxen cell, it was found positive, and the wax negative; the electricity of the stone being thus contrary to what would have happened in the open air. The other side, which was not in contact with the wax, acquired the same electricity that it would have done though the stone had been heated in the open air; so that both sides now became positive. In like manner the positive side of the stone, on being cooled in wax, became negative.

Phenomena.

6. On attempting to ascertain the state of the different sides of the tourmalin during the time it was heating in wax, many difficulties occurred. It was found impossible in these cases to know exactly when the stone begins to cool; besides, that in this method of treatment it must necessarily be some time in the open air before it can be presented to the electrometer; and the electricity of the sides in heating is by no means so remarkable as in cooling. In the experiments made with the tourmalin, when its positive side was buried in wax, it was generally found negative, though once or twice it seemed to be positive. On cooling it in quicksilver contained in a china cup, it always came out positive, and left the quicksilver negative; but this effect could not be concluded to be the consequence of applying the one to the other, because it is almost impossible to touch quicksilver without some degree of friction, which never fails to make both sides strongly positive though it be quite cold, and especially if the stone be dipped deep into it. At last, supposing that the stone would not be apt to receive any friction by simple pressure against the palm of the hand, he was induced to make the experiment, and found it fully to answer his expectations; for thus, each side of the stone was affected in a manner directly contrary to what would have happened in the open air.

7. Fastening the convex side of the large tourmalin to the end of a stick of sealing-wax, and pressing it against the palm of the hand, it acquired a strong negative electricity, contrary to what would have happened in the open air. Thus it continued till it had acquired all the power it could receive by means of the heat of the hand; after which it began to decrease, though it continued sensibly negative to the very last. On allowing the stone to cool in the open air, its negative power constantly increased till it became quite cold.

8. On heating the same flat side by means of a hot poker held near it, and then just touching it with the palm of the hand when so hot that it could not be borne for any length of time, it became positive. Letting it cool in the air it became negative, and on touching it again with the hand it became positive; and thus it might be made alternately positive and negative for a considerable time. At last, when it became so cool that the hand could bear it, it acquired a strong positive electricity, which continued till it came to the same degree of heat.

9. The wax was removed from the convex, and fastened to the flat side of the stone; in which circumstances it became weakly positive after receiving all the heat the hand could give it. On letting it cool in the open air it grew more strongly positive, and continued so till it was quite cold; and thus the same side became positive both with heating and cooling.

10. On heating the convex side by means of a poker, and pressing it against the palm of the hand as soon as it could be borne, it became pretty strongly negative; though it is extremely difficult to procure any appearance

(A) This would probably have been found always the case; for here the stone and mould acted in a manner similar to the electrophorus and its metal plate; the latter of which always discovers a greater electric power than the former.

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ance of negative electricity from this side; and care must be taken that a slight attraction of the electrified feather, by a body not electrified, be not mistaken for negative electricity.

11. On covering the tourmalin when hot with oil and tallow, no new appearances were produced; nor did the heating of it in boiling oil produce any other effect than lessening the electricity a little; and the event was the same when the tourmalin was covered with cement made of bees-wax and turpentine. On making a small tourmalin very hot, and dropping melted sealing-wax upon it, so as to cover it all over to the thickness of a crown piece, it was found to act through this coating nearly, if not quite, as well as if it had been exposed to the open air. Thus a pretty deception may be made; for if a tourmalin be inclosed in a stick of wax, the latter will seem to have acquired the properties of the stone.

12. On letting the stone cool in the vacuum of an air-pump, its virtue seemed to be diminished about one half, owing no doubt to the vacuum not being sufficiently perfect.

13. On fixing a thin piece of glass opposite and parallel to the flat side of the tourmalin, and about a quarter of an inch distance from it, in an exhausted receiver, the glass was so slightly electrified, that it could not be distinguished whether it was positive or negative.

13. On laying the stone upon the standard bar of the pyrometer, and communicating the heat to it by means of a spirit lamp, it was extremely difficult to determine the nature of the electricity while the heat was increasing to 70° ; during which time the index of the pyrometer moved about one 7200th part of an inch. But if the stone was taken off the bar, and an electrified thread or feather presented to that side which had lain next it, the convex side was always negative, and the flat one positive.

14. To determine what would be the effect of keeping the tourmalin in the very same degree of heat for a considerable time together, it was laid upon the middle of the bar, to which heat was communicated by two spirit lamps, one at each extremity; and making the index move 45 degrees, it was kept in the same degree for half an hour without the least sensible variation; and it was observed, that the upper side, which happened to be the convex one, was always electrified in a small degree, attracting a fine thread at the distance of about a quarter of an inch. If in that time it was taken off the bar, though ever so quick, and an electrified feather presented to it, the flat side, which lay upon the bar, was negative, and the upper side very slightly positive, which appeared only by its not attracting the feather. On putting a piece of glass between the stone and standard bar, keeping it likewise in the same degree of heat, and for the same space of time as before, the result was the same; the glass was slightly electrified, and of a kind opposite to that of the stone itself. To avoid the inconvenience of making one side of the stone hotter than another, which necessarily took place when it was heated on the pyrometer, the following method was used. By means of two rough places which happened to be in the stone, it was tied with a silk thread which touched only the extreme edge of it; and thus being perfectly insulated, it might be held at any distance from a candle, and heated to what degree was thought

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necessary; while, by twisting the string, it was made to present its sides alternately, and thus the heat was rendered very equal in both. After being made in this manner so hot that the hand could scarce bear it, it was kept in that situation for a quarter of an hour. Then, with a bundle of fine thread held for some time before in the same heat, the electricity which it had acquired by heating was taken off, and it was found to acquire very little if any; whence appeared the justness of an observation of Mr Canton's, that it is the change of heat, and not the degree of it, that produces the electric property of this stone.

15. On heating the stone suddenly, it may sometimes be handled and pressed with the fingers several times before any change takes place in the electricity which it acquires by heating, though it begins to cool the moment it is removed from the fire. In this case, however, the stone must be heated only to a small degree. When the heat is three or four times as great as is sufficient to change the electricity of the two sides, the virtue of the stone is the strongest, and appears to be so when it is tried in the very neighbourhood of the fire. In the very centre of the fire the stone never fails to cover itself with ashes attracted to it from every quarter; whence it acquired its name in Dutch.

16. The tourmalin often changes its electricity very slowly; and that which it acquires in cooling never fails to remain many hours upon it with very little diminution. It is even possible, that in some cases the electricity acquired by heating may be so strong as to overpower that which is acquired by cooling; so that both sides may show the same power in the whole operation. "I am very certain (says the Doctor), that in my hands both the sides of Dr Heberden's large tourmalin have frequently been positive for several hours together, without any appearance of either of them having been negative at all. At this time I generally heated the tourmalin, by presenting each side alternately to a red hot poker, or a piece of hot glass, held at the distance of about half an inch, and sometimes I held it in the focus of a burning mirror; but I have since found the same appearance when I heated it in the middle of an iron hoop made red hot. The stone in all these cases was fastened by its edge to a stick of sealing-wax. This appearance I have observed to happen the oftenest when the iron hoop has been exceedingly hot, so that the outside of the stone must have been heated some time before the inside; and I also think there is the greatest chance of producing this appearance, when the convex side of the stone is made the hotter of the two. When I heat the large tourmalin in this manner, I seldom fail to make both sides of the stone positive till it be about blood-warm. I then generally observe a ragged part of the flat side towards one end of the stone become negative first, and by degrees the rest of the flat side; but very often one part of the flat side will, in this method of treatment, be strongly positive half an hour after the other part is become negative."

SECT. V. *Of the different Theories of Electricity, with the principal Experiments brought in favour of each, and which tend more particularly to show the Nature of the Electric Fluid.*

It is not to be supposed, that the phenomena of elec-

Pheno-
mena.

⁵⁵ Theory. electricity would long be observed without attempts to account for them. In fact, this was attempted by Thales, who first observed the attractive power of amber. At this property he was so much surprised, that he reckoned the amber to be *animated*. With regard to the sentiments of Theophrastus on this subject, we are entirely in the dark; but, among the succeeding electricians, all the phenomena were derived from *unctuous effluvia* emitted by the excited electric. These were supposed to fasten upon all bodies in their way, and to carry back with them all that were not too heavy. For, at that time, effluvia of every kind were supposed to return to the bodies from which they were emitted; since nobody could otherwise account for the substance not being sensibly wasted by the constant emission. When these light bodies on which the unctuous effluvia had fastened were arrived at the excited electric, a fresh emission of the effluvia was supposed to carry them back again. But this effect of the effluvia was not thought of till electric repulsion, as well as attraction, had been fully observed.

Electric phenomena ascribed to unctuous effluvia.

The discovery of a difference between conducting and non-conducting substances, threw considerable difficulties in the way of those who maintained the hypothesis of unctuous effluvia. When the Newtonian philosophy began to be pretty generally received, the terms *attraction* and *repulsion* were quickly introduced into electricity, as well as other branches of philosophy; and the electric effluvia, instead of being of an *unctuous* nature, were said to be of an attractive or repulsive one. At the same time, the apparent stop which is put to the progress of these effluvia by any electric substance, introduced a question not yet well decided, viz. Whether electric bodies are penetrable by the fluid or not?

⁵⁶ Two electric fluids supposed by Mr du Fay.

When Mr Du Fay discovered the two opposite species of electricity, at that time distinguished by the names of *vitreous* and *resinous*, and afterwards by those of *plus* and *minus*, or positive and negative, he formed the idea of two distinct electric fluids. Both these were supposed to have a *repulsive* power with respect to themselves, but an *attractive* one with regard to one another.

As long as electrical attraction and repulsion were the only phenomena to be accounted for, this theory served the purpose well enough. To account for attraction and repulsion by an *attractive* and *repulsive* power, was indeed no explication at all; but it afforded a change of terms, which is too frequently mistaken for an explanation both in electricity and other parts of philosophy.—At last, however, Mr Du Fay dropped his opinion concerning the existence of two electric fluids, and thought that all the phenomena might be accounted for from the action of a single one. The vitreous or positive electricity, which was supposed to be the stronger, he thought might attract the negative, or weaker electricity.—It is indeed true, that, in many experiments, the positive electricity doth manifest a superiority in strength over the negative, something like that superior degree of vigour which is observed in one of the poles of a loadstone over the other. According to Mr Du Fay's own principles, however, had this been the case, a body positively electrified ought to have attracted one electrified negatively more

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weakly than one not electrified at all; which is contrary to experience.

During all this time, it was imagined, that the electric matter, whether it consisted of one or more fluids, was produced from the electric body by friction; but by a discovery of Dr Watson's, it became universally believed, that the glass globes and tubes served only to set the fluid in motion, but by no means to produce it. He was led to this discovery by observing, that, upon rubbing the glass tube, while he was standing upon cakes of wax or rosin (in order, as he expected, to prevent any discharge of the electric matter upon the floor), the power was, contrary to his expectation, so much lessened, that no snapping could be observed upon another person's touching any part of his body; but that, if a person not electrified held his hand near the tube while it was rubbed, the snapping was very sensible. The event was the same when the globe was whirled in similar circumstances. For, if the man who turned the wheel, and who, together with the machine, was suspended upon silk, touched the floor with one foot, the electric fire appeared upon the conductor; but if he kept himself free from any communication with the floor, little or no fire was produced.—He observed, that only a spark or two would appear between his hand and the insulated machine, unless he at the same time formed a communication between the conductor and the floor; but that then there was a constant and copious flux of the electric matter observed between them. From these, and some other experiments of a similar kind, the Doctor discovered what he called the *complete circulation* of the electric matter. When he found, that, by cutting off the communication of the glass globe with the floor, all electric operations were stopped, he concluded, that the electric fluid was conveyed from the floor to the rubber, and from thence to the globe. For the same reason, seeing the rubber, or the man who had a communication with it, gave no sparks but when the conductor was connected with the floor, he as naturally concluded, that the globe was supplied from the conductor, as he had before concluded that it was supplied from the rubber. From all this he was at last led to form a new theory of electricity, namely, that, in electric operations, there was both an *afflux* of electric matter to the globe and the conductor, and likewise an *efflux* of the same electric matter from them. Finding that a piece of leaf-silver was suspended between a plate electrified by the conductor, and another communicating with the floor, he reasons from it in the following manner. "No body can be suspended in equilibrium but by the joint action of two different directions of power: so here the blast of electric ether from the floor setting through it, drives the silver towards the plate electrified. We find from hence, likewise, that the draught of electric ether from the floor is always in proportion to the quantity thrown by the globe over the gun-barrel (the prime conductor at that time made use of), or the equilibrium by which the silver is suspended could not be maintained." Some time after, however, the Doctor retracted this opinion concerning the afflux and efflux, and supposed that all the electric phenomena might be accounted for from the excess or diminution of the quantity of electric matter

Theory.

⁵⁷ Electric matter discovered to come from the earth.

⁵⁸ Dr Watson's theory of afflux and efflux.

Theory.

contained in different bodies. This theory was afterwards adopted by Dr Franklin, and continues to be generally received.

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Difficulty concerning the direction of the electric fluid.

One great difficulty with which the first electricians were embarrassed (and which is yet scarcely removed), was to ascertain the direction of the fluid. At first, all electric powers, as we have already observed, were supposed to reside in the excited globe or glass tube. The electric spark therefore was imagined to proceed from the electrified body towards any conductor that was presented towards it. It was never imagined there could be any difference in this respect, whether it was amber, glass, sealing-wax, or any thing else that was excited. This progress of the electric matter was thought to be quite evident to the senses; and therefore the observation of electric appearances at an insulated rubber occasioned the greatest astonishment.— In this case, the current could not be supposed to flow both from the rubber and the conductor, and yet the first appearances were the same. To provide a supply of the electric matter, therefore, philosophers were obliged to suppose, that, notwithstanding appearances were in both cases much the same, the electric fluid was really emitted in one case by the electrified body, and received by it in the other. But now being obliged to give up the evidence from sight for the manner of its progress, they were at a loss, whether, in the usual method of electrifying by excited glass, the fluid proceeded from the rubber to the conductor, or from the conductor to the rubber. It was, however, soon found, that the electricity at the rubber was the reverse of that at the conductor, and in all respects the same with that which had before been produced by the friction of sealing-wax, sulphur, rosin, &c. Seeing, therefore, that both the electricities were produced at the same time, by one and the same electric, and by the same friction, all philosophers were naturally led to conclude, that both were modifications of one fluid; though in what manner that fluid was modified throughout the immense variety of electric phenomena, was a matter not easy to be determined.

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Abbe Nollet's theory.

On this subject, the Abbe Nollet adopted the doctrine of *afflux* and *efflux* already mentioned. He supposed, that, in all electrical operations, the fluid is thrown into two opposite motions; that the afflux of this matter drives all light bodies before it by impulse upon the electrified body, and its efflux carries them back again. He was, however, very much embarrassed in accounting for facts where both these currents must be considered; as in the quick alternate attraction and repulsion of light bodies by an excited glass tube, or other excited electric. To obviate this difficulty, he supposes that every excited electric, and likewise every body to which electricity is communicated, has two orders of pores, one for the emission of the effluvia, and another for the reception of them. Mr de Tour improved upon Nollet's hypothesis, and supposed that there is a difference between the affluent and effluent current; and that the particles of the fluid are thrown into vibrations of different qualities, which makes one of these currents more copious than the other, according as sulphur or glass is used. It is impossible, however, that suppositions so very arbitrary could be at all satisfactory, or received as proper solutions of the electric phenomena.

Theory.

No less difficult was it for philosophers to determine the nature of the electric fluid, than its manner of acting. It had been in a manner generally believed, that *fire* was not a distinct element, but arose from some violent repulsions, rarefactions, &c. among the particles of ignited bodies. The great resemblance of the electric fluid to elementary fire, however, seemed strongly to militate against this opinion. The hypothesis therefore of fire as a distinct principle or element began to revive. Some maintained, that the electric fluid was really this principle; others thought that it was a fluid *sui generis*, very much resembling that of fire; while others, with Mr Boulanger at their head, imagined that it was nothing more than the finer parts of the atmosphere, which crowded upon the surfaces of electric bodies, when the grosser parts had been driven away by the friction of the rubber.

This last opinion, however, soon received a full refutation from the experiments of Dr Watson above-mentioned; by which it was proved, that the electric matter came not from the atmosphere, but from the earth. About the same time the Leyden phial was discovered; and the extraordinary effects of it rendered the inquiries into the nature of the electric fluid much more general than before. But still, the violent prejudice against the existence of fire as a real element or fluid distinct from terrestrial bodies, continued in its full vigour, and the most extravagant theories were acquiesced in, rather than the simple position above mentioned. It would be tedious, and indeed impossible, to give an account of all the theories which were now invented. One of the most remarkable, and most consistent, was that of Mr Wilson. According to this gentleman, the chief agent in all the operations of electricity, is Sir Isaac Newton's ether; which is more or less dense in all bodies in proportion to the smallness of their pores, except that it is much denser in sulphureous and unctuous bodies. To this ether are ascribed the principal phenomena of attraction and repulsion: the light, the sulphureous or rather phosphoreal smell with which violent electricity is always attended, and other sensible qualities, are ascribed to the grosser particles of bodies driven from them by the forcible action of this ether. He also endeavours to explain many electrical phenomena by means of a subtle medium at the surface of all bodies; which is the cause of the refraction and reflection of the rays of light, and also resists the entrance and exit of this ether. This medium, he says, extends to a small distance from the body, and is of the same nature with what is called the *electric fluid*. On the surface of conductors this medium is rare, and easily admits the passage of the electric fluid; whereas, on the surface of electrics, it is dense and resists it. The same medium is rarefied by heat, which thus changes conductors into non-conductors. By far the greater number of philosophers, however, rejected the opinion of Mr Wilson; and as they neither chose to allow the electric fluid to be *fire* nor *ether*, they were obliged to own that it was a fluid *sui generis*, i. e. one of whose nature they were totally ignorant.

But while philosophers were thus embarrassed in their electrical theories, a vast number of interesting phenomena were discovered by the assiduity of a number of different electricians in different countries. Mr Winckler observed, that if glass was rubbed on the inside,

Theory

Theory.

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Great power of electricity excited by some philosophers.

side, it would show strong appearances of electricity on the outside; which seemed to favour the opinion of the permeability of glass to the electric matter. Other German electricians used several globes at a time, and imagined they found effects proportionable; tho' this has since been found a mistake. Such a prodigious force, however, could they excite by means of these globes whirled by a large wheel, and rubbed by the hand or with woollen cloth, that, according to their own accounts, blood could be drawn from a finger by means of the electric spark, the skin would burst, and a wound appear as if made by a caustic. If several globes or tubes were used, they said, that the motion of the heart and arteries would be very perceptibly increased in such as were electrified; and that, if a vein was opened in these circumstances, the blood issuing from it would appear like lucid phosphorus, and run out faster than when the person was not electrified. Mr P. Gordon, a Scots Benedictine monk, and professor of philosophy at Erford, increased the electric sparks to such a degree, that they were felt from a man's head to his foot, so that he could hardly take them without falling down with giddiness, and small birds were killed by them. This was effected by conveying the electricity with iron wires to the distance of 200 ells from the place of excitation. He also found that the sparks were stronger when the wires were thick than when they were small.

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Electric fluid found to act according to the largeness of electrified surface.

While the power of electricity was thus tried, another question of great importance was likewise decided, namely, Whether electricity acted according to the largeness of the surface of bodies? This was found to be in proportion to the surface, and not the solid contents. The magnetic effluvia also were found not to interfere in the least with the electrical ones. An electrified loadstone attracted light bodies of all kinds by its electric virtue, at the same time that it attracted iron and steel by its peculiar magnetic virtue. The attractive virtue of electricity was also found to pervade glass so powerfully, that a thread was attracted through five exhausted receivers, and seemingly with more vigour than it would have been by the excited tube alone in the open air.

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Dr Franklin's theory.

Such was the state of philosophical opinions concerning electricity, when Dr Franklin first invented his theory concerning positive and negative, or *plus* and *minus*, electricity. This had been already suggested by Dr Watfon, but was not so fully explained by him as by Dr Franklin; on which account the latter is generally reckoned to be the sole inventor. According to this theory, all the operations in electricity depend upon one fluid *sui generis*, extremely subtle and elastic. Between the particles of this fluid there subsists a very strong repulsion with regard to each other, and as strong an attraction with regard to other matter. Thus, according to Dr Franklin's hypothesis, one quantity of electric matter will repel another quantity of the same, but will attract and be attracted by any terrestrial matter that happens to be near it. The pores of all bodies are supposed to be full of this subtle fluid; and when its equilibrium is not disturbed, that is, when there is in any body neither more nor less than its natural share, or than that quantity which it is capable of retaining by its own attraction, the fluid does not manifest itself to our senses. The action of the

rubber upon an electric disturbs this equilibrium, occasioning a deficiency of the fluid in one place, and a redundancy of it in another. This equilibrium being forcibly disturbed, the mutual repulsion of the particles of the fluid is necessarily exerted to restore it. If two bodies be both of them overcharged, the electric atmospheres repel each other, and both the bodies recede from one another to places where the fluid is less dense. For as there is supposed to be a mutual attraction between all bodies and the electric fluid, such bodies as are electrified must go along with their atmospheres. If both the bodies are exhausted of their natural share of this fluid, they are both attracted by the denser fluid existing either in the atmosphere contiguous to them, or in other neighbouring bodies; which occasions them still to recede from one another as if they were overcharged.

This is the Franklinian doctrine concerning the cause of electric attraction and repulsion; but it is evident, that the reason just now given why bodies negatively attracted ought to repel one another, is by no means satisfactory. Dr Franklin himself had framed his hypothesis before he knew that bodies negatively electrified would repel one another; and when he came afterwards to learn it, he was surprised, and acknowledged that he could not satisfactorily account for it. Other philosophers therefore invented different solutions of this difficulty, of which that above mentioned is one. But by some this was rejected. They said, that as the denser electric fluid, surrounding two bodies negatively electrified, acts equally on all sides of those bodies, it cannot occasion their repulsion. The repulsion, according to them, is owing rather to an accumulation of the electric on the surfaces of the two bodies; which accumulation is produced by the attraction, and the difficulty the fluid finds in entering them. This difficulty is supposed chiefly to be owing to the air on the surface of bodies, which Dr Priestley says is probably a little condensed there. This he deduces from an experiment of Mr Wilson, corrected by Mr Canton. The experiment was made in order to observe the course of the electric light through a Torricellian vacuum. A singular appearance of light was observed upon the surface of the quicksilver, at which the fluid was supposed to enter. Mr Wilson supposed that this was owing to a subtle medium spread over the surface of the quicksilver, and which prevented the easy entrance of the electric fluid. But this was afterwards discovered by Mr Canton to be owing to a small quantity of air which had been left in the tube. It is plain, however, that as the attraction is equal all round, and likewise the difficulty with which the fluid penetrates the air, bodies negatively electrified ought not to repel one another on this supposition more than the former. Nay, they ought to attract each other; because, in the place of contact, the resistance of the air would be taken off, and the electric fluid could come from all other quarters by the attraction of the bodies.

Mr Cavallo, who seems to have undertaken the defence of this hypothesis in all cases, gives another reason why bodies negatively electrified should repel each other. In a chapter intitled, "A Compendious View of the principal properties of Electricity," among others he gives the following: "No electricity can be

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Difficulty concerning the reason why bodies negatively electrified repel one another.

* Franklin's Letters.
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Different solutions of this difficulty.

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Mr Cavallo's solution.

Theory.

observed upon the surface of any electrified body, except that surface is contiguous to an electric, which electric can some how or other acquire a contrary electricity at a little distance. Otherwise:—No electricity can appear upon the surface of any electrified body, except that surface is opposite to another body which has actually acquired the contrary electricity, and these contrarily electrified bodies are separated by an electric. On considering this principle (adds he), it may be asked, Why an electricity can be observed upon the surface of an electrified body that is insulated at a considerable distance from other conductors? Or, Which is the electric that is contiguous to the surface of an electrified conductor or excited electric, and which has actually acquired a contrary electricity at a little distance from the said surface? To this question it is answered, that the air is, in general, the electric which is opposite to the surface of any electrified body; which, not being a perfect conductor, does easily acquire a contrary electricity on a stratum of its substance that is at a little distance from the electrified body; and, in consequence of this stratum, it acquires another stratum contrarily electrified, and at a little distance from the former: to this other strata succeed, alternately possessed of positive and negative electricities, and decreasing in power till they vanish. This assertion is easily proved by several experiments, particularly the following. If the end of a pretty long glass tube be presented to a body electrified, for instance, positively, the tube will be found electrified positively also for the space of one or two inches at that end; but beyond that space, will be found two or three inches electrified negatively: after that another positive electricity will appear; and so alternately, a positive and a negative zone will follow one another, always weaker and weaker in power, till at last they quite vanish. This shows, that, in general, when an electric sufficiently dense is presented to an electrified body, it acquires successive zones or strata of positive and negative electricity."

From this fact (which, with the utmost impropriety, he terms a *law* of electricity, whereas it is most evidently the *effect* of a law, and not the law itself), Mr Cavallo gives the following reason why bodies negatively electrified repel one another. "As to the repulsion existing between bodies possessed of the same electricity; in order to understand its explanation thoroughly, the reader must be reminded of the principle above-mentioned, which is, that no electricity, i. e. the electric fluid proper to a body, can either be augmented or diminished upon the surface of that body, except the said surface is contiguous to an electric, which can acquire a contrary electricity at a little distance: from whence it follows, that no electricity can be displayed upon the facing surfaces of two bodies that are sufficiently near to one another, and both possessed of the same electricity; for the air that lies between those contiguous surfaces has no liberty of acquiring any contrary electricity. This being premised, the explanation of electric repulsion becomes very easy. Suppose, for instance, that two small bodies are freely suspended by insulated threads; so that, when they are not electrified, they may hang contiguous to one another. Now suppose these bodies to be electrified either positively or negatively, and then they must repel one

another: for either the increased or the diminished natural quantity of electric fluid in these bodies will endeavour to diffusive itself equally over every part of the surfaces of these bodies; and this endeavour will cause the said bodies to recede from each other, so that a quantity of air may be interposed between their surfaces, sufficient to acquire a contrary electricity at a little distance from the said surfaces. Otherwise: If the bodies possessed of the same electricity do not repel each other, so that a sufficient quantity of air may be interposed between their surfaces, the increased quantity of electric fluid when the bodies are electrified positively, or the remnant of it when they are electrified negatively, by the above principle cannot be diffused equally throughout or over the surfaces of these bodies; for no electricity can appear upon the surfaces of bodies in contact, or that are very near each other. But the electric fluid, by attracting the particles of matter, endeavours to diffuse itself equally throughout or over the surfaces of these bodies; therefore the said bodies are, by this endeavour, forced to repel one another."

Theory.

This theory is evidently no solution of the difficulty; seeing it is only explaining one fact by another, which requires explanation at least as much as the first. But though this should be overlooked, it is still insufficient; for, granting that bodies negatively electrified ought to repel one another till the electricity is equally diffused along their surfaces, yet when this is accomplished, the repulsion ought to cease. Now, there is no occasion for supposing the bodies to be electrified while they are in contact, or nearly so. One may be electrified negatively in one corner of a room, and another in the other. The electrification may also be continued for any length of time we please, so that it is not possible to suppose but the electric matter must have diffused itself equally along the surfaces of both: yet, if we attempt to bring these bodies together, we shall find that they will repel each other very violently; which ought not to be the case, according to Mr Cavallo's supposition.

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Insufficient.

What gave the greatest reputation to Dr Franklin's theory, however, is the easy solution which it affords of all the phenomena of the Leyden phial. The fluid is supposed to move with the greatest ease in bodies which are conductors, but with extreme difficulty in *electrics per se*; inasmuch that glass is absolutely impermeable to it. It is moreover supposed, that all electrics, and particularly glass, on account of the smallness of their pores, do at all times contain an exceeding great, and always an equal quantity of this fluid; so that no more can be thrown into any one part of any electric substance, except the same quantity go out at another, and the gain be exactly equal to the loss. These things being previously supposed, the phenomena of charging and discharging a plate of glass admit of an easy solution. In the usual manner of electrifying by a smooth glass globe, all the electric matter is supplied by the rubber from all the bodies which communicate with it. If it be made to communicate with nothing but one of the coatings of a plate of glass, while the conductor communicates with the other, that side of the glass which communicates with the rubber must necessarily be exhausted in order to supply the conductor, which must convey the whole of it to the side.

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Dr Franklin's explanation of the phenomena of the Leyden phial.

Theory. side with which it communicates. By this operation, therefore, the electric fluid becomes almost entirely exhausted on one side of the plate, while it is as much accumulated on the other; and the discharge is made by the electric fluid rushing, as soon as an opportunity is given it by means of proper conductors, from the side which was overloaded to that which is exhausted.

It is not, however, necessary to this theory, that the very same individual particles of electric matter which were thrown upon one side of the plate, should make the whole circuit of the intervening conductors, especially in very great distances, so as actually to arrive at the exhausted side. It may be sufficient to suppose, that the additional quantity of fluid displaces and occupies the space of an equal portion of the natural quantity of fluid belonging to those conductors in the circuit which lay contiguous to the charged side of the glass. This displaced fluid may drive forwards an equal quantity of the same matter in the next conductor; and thus the progress may continue till the exhausted side of the glass is supplied by the fluid naturally existing in the conductors contiguous to it. In this case, the motion of the electric fluid, in an explosion, will rather resemble the vibration of the air in sounds, than a current of it in winds.

It will soon be acknowledged (says Dr Priestley), that while the substance of the glass is supposed to contain as much as it can possibly hold of the electric fluid, no part of it can be forced into one of the sides, without obliging an equal quantity to quit the other side: but it may be thought a difficulty upon this hypothesis, that one of the sides of a glass plate cannot be exhausted, without the other receiving more than its natural share; particularly, as the particles of this fluid are supposed to be repulsive of one another. But it must be considered, that the attraction of the glass is sufficient to retain even the large quantity of electric fluid which is natural to it, against all attempts to withdraw it, unless that eager attraction can be satisfied by the admission of an equal quantity from some other quarter. When this opportunity of a supply is given, by connecting one of the coatings with the rubber, and the other with the conductor, the two attempts to introduce more of the fluids into one of the sides are made, in a manner, at the same instant. The action of the rubber tends to disturb the equilibrium of the fluid in the glass; and no sooner has a spark quitted one of the sides, to go to the rubber, than it is supplied by the conductor on the other; and the difficulty with which these additional particles move in the substance of the glass, effectually prevents its reaching the opposite exhausted side. It is not said, however, but that either side of the glass may give or receive a small quantity of the electric fluid, without altering the quantity on the opposite side. It is only a very considerable part of the charge that is meant, when one side is said to be filled while the other is exhausted.

It is a little remarkable, adds Dr Priestley, that the electric fluid, in this and in every other hypothesis, should so much resemble the ether of Sir Isaac Newton in some respects, and yet differ from it so essentially in others. The electric fluid is supposed to be, like e-

Theory. ther, extremely subtle and elastic, that is, repulsive of itself; but instead of being, like the ether, repelled by all other matter, it is strongly attracted by it: so that, far from being, like the ether, rarer in the small than in the large pores of bodies, rarer within the bodies than at their surfaces, and rarer at their surfaces than at any distance from them; it must be denser in small than in large pores, denser within the substance of bodies than at their surfaces, and denser at their surfaces than at a distance from them.

To account for the attraction of light bodies, and other electrical appearances, in air of the same density with the common atmosphere, when glass (which is supposed to be impermeable to electricity) is interposed; it is conceived, that the addition or subtraction of the electric fluid, by the action of the excited electric on one side of the glass, occasions, as in the experiment of the Leyden phial, a subtraction or addition of the fluid on the opposite side. The state of the fluid, therefore, on the opposite side being altered, all light bodies within the sphere of its action must be affected in the very same manner as if the effluvia of the excited electric had actually penetrated the glass, according to the opinions of all electricians before Dr Franklin.

This hypothesis has been in some measure improved by Mr Æpinus, in a treatise intitled, "Tentamen Theoriz Electricitatis & Magnetismi." He extends the property of impermeability to air, and all electrics, as well as glass. He supposes *impermeability* to consist in the great difficulty with which electric substances admit the fluid into their pores, and the slowness with which it moves in them. In consequence of this impermeability of air to the electric fluid, he denies the existence of electric atmospheres, and thinks that Dr Franklin's theory will do much better without them. He also imagines, that all the particles of matter are repulsive of one another: for that otherwise (since all substances have in them a certain quantity of the electric fluid, the particles of which repel one another and are attracted by all other matter), it could not happen, that bodies in their natural state with respect to electricity, should neither attract nor repel one another. He also introduces a number of mathematical calculations; the result of which (says Dr Priestley, with a great deal of probability) cannot be depended upon.

The above is a full explanation of the theory of electricity at present most generally received. It depends on the following principles. 1. All terrestrial substances, as well as the atmosphere which surrounds the earth, are full of electric matter. 2. Glass, and other electric substances, though they contain a great deal of electric matter, are nevertheless *impermeable* by it. 3. This electric matter violently repels itself, and attracts all other matter. 4. By the excitation of an electric, the equilibrium of the fluid contained in it is broken; and one part of it is overloaded with electricity, while the other contains too little. 5. Conducting substances are permeable to the electric matter through their whole substance, and do not conduct it merely over their surface. 6. Positive electricity is when a body has too much of the electric fluid, and negative electricity when it has too little. Of these positions we shall now adduce those proofs drawn from different

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Attraction
and repul-
sion thro'
glass ac-
counted
for.

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Principles
on which
Dr Frank-
lin's theory
depends.

Theory. different facts, which seem in the strongest manner to confirm them.

I. "All terrestrial substances, as well as the atmosphere which surrounds the earth, are filled with electric fluid."—Of this the proofs are very easy. There is no place of the earth or sea, where the electric fire may not be collected by making a communication between it and the rubber of an electric machine. Therefore, considering that the whole earth is moist, that moisture is a conductor of electricity, and that every part of the earth must thus communicate with another, it is certain that the electric matter must diffuse itself as far as the moisture of the earth reaches; and this we may reasonably suppose to be to the very centre.

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Proofs of
atmospheric
electricity.

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Mr Cavallo's
directions
concerning the
electrical
kite.

With regard to the atmosphere, the case is equally clear. We have formerly mentioned in general, that Dr Franklin, and others, had collected electricity from the atmosphere in great quantity during the time of thunder-storms; but it is now found that it may be collected from the air at any time. The best instrument for this purpose is the electrical kite. Mr Cavallo, who hath made a great many experiments in atmospheric electricity, observes that the whole power of this machine lies in the string. A common school-boy's kite answers the purpose as well as any other. The best method of making the string is by twisting two threads of common twine with one of that copper-thread which is used for trimmings. When a kite constructed in this manner was raised, he says, he always observed the string to give signs of electricity, except once. The weather was warm, and the wind so weak, that the kite was raised with difficulty, and could hardly be kept up for a few minutes. Afterwards, however, when the wind increased, he obtained, as usual, a pretty strong positive electricity. Concerning the management of this kite he gives the following directions.

"In raising the kite, when the weather is very cloudy and rainy, in which time there is danger of meeting with a great quantity of electricity, I generally use to hang upon the string *AB* (Plate CLXXVII. fig. 78.) the hook of a chain *C*, the other extremity of which falls on the ground. Sometimes I use another caution besides, which is to stand upon an insulating stool; in which situation, I think, that if any quantity of electricity, suddenly discharged by the clouds, strikes the kite, it cannot much affect any person. As to insulated reels, and other such like instruments that some gentlemen have used to raise the kite without any danger of receiving a shock; fit for the purpose as they may appear in theory, they are yet very inconvenient to be managed. Except the kite be raised in the time of a thunder-storm, there is no great danger for the operator to receive any shock. Although I have raised my electrical kite hundreds of times without any caution whatever, I have very seldom received a few exceedingly slight shocks in my arms. In time of a thunder-storm, if the kite has not been raised before, I would not advise a person to raise it while the stormy clouds are just overhead; the danger at such a time being very great, even with the precautions above-mentioned: at that time the electricity of the clouds may be observed, without raising the kite, by a cork-ball electrometer held in the hand in an open place, or,

Theory. if it rains, by the electrometer for rain, to be described hereafter.

"By making use of this instrument, I am obliged to keep the kite up no longer than it is necessary to charge the phial, in order to observe the quality of the electricity in the atmosphere; for after the kite has been drawn in, and brought home, I can then examine the electricity of the inside of the phial, which is the same as that of the kite. When the electricity of the kite is very strong, I fix a chain communicating with the ground, at about six inches distance from the string, which may carry off its electricity in case this should increase so much as to put the bystanders in danger."

With all his caution, however, it seems Mr Cavallo could not always avoid danger, even when there was no thunder; as appears from the following account. ^{Great quantity of electricity brought down from a cloud.} "October 18. 1775. After having rained a great deal in the morning and night before, the weather became a little clear in the afternoon, the clouds appearing separated, and pretty well defined. The wind was west, and rather strong, and the atmosphere in a temperate degree of heat. In these circumstances, at three P. M. I raised my electrical kite with 360 feet of string. After the end of the string had been insulated, and a leather ball covered with tin-foil had been hanged to it, I tried the power and quality of the electricity, which appeared to be positive and pretty strong. In a short time, a small cloud passing over, the electricity increased a little; but the cloud being gone, it decreased again to its former degree. The string of the kite was now fastened by the silk lace to a post in the yard of the house, and I was repeatedly charging two coated phials and giving shocks with them. While I was so doing, the electricity, which was still positive, began to decrease, and in two or three minutes it became so weak that it could hardly be perceived with a very sensible cork-ball electrometer. Observing at the same time, that a large and black cloud was approaching the zenith (which, no doubt, caused the decrease of electricity), indicating imminent rain, I introduced the end of the string through a window in a first-floor room, wherein I fastened it by the silk lace to an old chair. The quadrant electrometer was set upon the same window, and was by means of a wire connected with the string of the kite. Being now three quarters after three o'clock, the electricity was absolutely imperceptible: however, in about three minutes time it became again perceptible; but, upon trial, was now found to be negative. It is therefore plain, that its stopping was nothing more than a change from positive to negative; which was evidently occasioned by the approach of the cloud, part of which by this time had reached the zenith of the kite, and the rain also had begun to fall in large drops. The cloud also came farther on; the rain increased; and the electricity keeping pace with it, the electrometer soon arrived at 15°. Seeing now that the electricity was pretty strong, I began again to charge the two coated phials, and to give shocks with them; but the phials had not been charged above three or four times, before I perceived that the index of the electrometer was arrived at 35°, and was keeping still increasing. The shocks being now very smart, I desisted from charging the phials any longer; and, considering the rapid advance of the electricity, thought to take

Theory. take off the insulation of the string, in case that, if it should increase farther, it might silently be conducted to the earth without causing any bad accident by being accumulated in the insulated string. To effect this, as I had no proper apparatus near me, I thought to remove the silk lace, and fasten the string itself to the chair. Accordingly I disengaged the wire that connected the electrometer with the string; laid hold of the string; untied it from the silk lace, and fastened it to the chair: but while I effected this, which took up less than half a minute of time, I received about 12 or 15 very strong shocks, which I felt all along my arms, in my breast, and legs; shaking me in such a manner, that I had hardly power enough to effect my purpose, and to warn the people in the room to keep their distance. As soon as I took my hands off the string, the electricity (in consequence of the chair being a bad conductor) began to snap between the string and the shutter of the window, which was the nearest body to it. The snappings, which were audible at a good distance out of the room, were at first isochronous with the shocks which I had received; but, in about a minute's time, oftener; so that the people of the house compared their sound to the rattling noise of a jack going when the fly is off. The cloud now was just over the kite; it was black, and well defined, almost of a circular form, its diameter appearing to be about 40°. The rain was copious, but not remarkably heavy. As the cloud was going off, the electrical snapping began to weaken, and in a short time became inaudible. I went then near the string, and finding the electricity weak, but still negative, I insulated it again, thinking to keep up the kite some time longer: but observing that another larger and denser cloud was approaching towards the zenith, and I had then no proper apparatus at hand to prevent every possible bad accident, resolved to pull the kite in: accordingly a gentleman who was by me began pulling it in, while I was winding up the string. The cloud was now very nearly over the kite; and the gentleman told me that he had received one or two slight shocks in his arms; and that, if he was to receive another, he would certainly let the string go: upon which I laid hold of the string, and pulled the kite in as fast as I could without any farther observation; being then ten minutes after four o'clock.—N. B. There was neither thunder nor lightning perceived that day, nor indeed for some days before or after."

From his observations on the electricity of the atmosphere, Mr Cavallo deduces the following conclusions.

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Conclusions
drawn from
the experi-
ments.

"1. That there is in the atmosphere at all times a quantity of electricity; for whenever I use the above-mentioned instrument, it always acquires some electricity."

"2. That the electricity of the atmosphere, or fogs, is always of the same kind, namely, positive; for the electrometer is always negative, except when it is evidently influenced by heavy clouds near the zenith."

"3. That, in general, the strongest electricity is observable in thick fogs, and also in frosty weather; and the weakest, when it is cloudy, warm, and very near raining: but it does not seem to be less by night than in the day."

"4. That in a more elevated place the electricity is stronger than in a lower one; for having tried the atmospheric electrometer both in the stone and iron gallery on the cupola of St Paul's cathedral, I found that the balls diverged much more in the latter than in the former less elevated place. Hence it appears, that if this rule takes place at any distance from the earth, the electricity in the upper regions of the atmosphere must be exceedingly strong."

The conclusions drawn from the experiments with the kites, are as follow.

"1. The air appears to be electrified at all times; its electricity is constantly positive, and much stronger in frosty than in warm weather; but it is by no means less in the night than in the day time."

"2. The presence of the clouds generally lessens the electricity of the kite; sometimes it has no effect upon it; and it is very seldom that it increases it a little." To this the above mentioned instance is a most remarkable exception.

"3. When it rains, the electricity of the kite is generally negative, and very seldom positive."

"4. The aurora borealis seems not to affect the electricity of the kite."

"5. The electric spark taken from the string of the kite, or from any insulated conductor connected with it, especially when it does not rain, is very seldom longer than a quarter of an inch; but it is exceedingly pungent. When the index of the electrometer is not higher than 20°, the person that takes the spark will feel the effect of it in his legs; it appearing more like the discharge of an electric jar than the spark taken from the prime conductor of an electrical machine."

"6. The electricity of the kite is generally stronger or weaker, according as the string is longer or shorter; but it does not keep any exact proportion to it. The electricity, for instance, brought down by a string of 100 yards, may raise the index of the electrometer to 20, when, with double that length of string, the index of the electrometer will not go higher than 25."

"7. When the weather is damp, and the electricity is pretty strong, the index of the electrometer, after taking a spark from the string, or presenting the knob of a coated phial to it, rises surprisingly quick to its usual place; but in dry and warm weather it rises exceedingly slow."

II. The second position requisite for establishing Dr Franklin's theory is, "That glass and other electric substances, though they contain a great deal of electric matter, are nevertheless *impermeable* by it." This assertion evidently has a contradictory appearance. It is very difficult, if not impossible, to conceive, that any substance can be full of a fluid, and yet impermeable by that fluid; especially when we continually talk of putting in an additional quantity into one side, and taking out of the other. Nay, what is still more extraordinary, the thinner the glass is, *i. e.* the less quantity of electric matter it can contain, the more we are able to put into it; for the thinner a glass is, the more easily does it receive a high charge."

The chief arguments for the impermeability of glass by the electric fluid are drawn from the phenomena of the Leyden phial. It is indeed very plain, that there is in that case an expulsion of fire from the outside at the

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Arguments
for the im-
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Theory.

the same time that it is thrown upon the inside. This appears from numberless experiments, but is most readily observable in the following. Let a coated phial be set upon an insulating stand, and the knob of another phial brought near the coating of the first. As soon then as the electric sparks are discharged from the prime conductor to the knob of the first bottle, an equal number will be observed to proceed from the coating of the first to the knob of the second. This is very remarkable, and an unphilosophical observer will scarce ever fail to conclude, that the fire runs directly through the substance of the glass. Dr Franklin, however, concludes that it does not, because there is found a very great accumulation of electricity on the inside of the glass, which discovers itself by a violent flash and explosion when a communication is made between the outside and inside coatings. But it must be observed, that there is here no other reason for concluding the glass to be impermeable, except that we suppose the electric matter to be accumulated on one side of the glass, and deficient on the other. If this supposition therefore cannot be proved, the evidence of sense, which indeed is very strong in favour of the permeability, must undoubtedly preponderate. It is said, indeed, that if the glass was permeable by the electric matter, a phial would be discharged immediately after being charged, or rather could never be charged at all; because the matter would no sooner be thrown upon one side than it would fly off from the other. This supposition, however, depends entirely upon the above-mentioned one, namely, that in bodies positively electrified there is an accumulation, and in such as are negatively electrified there is a deficiency of fluid; which never can be proved.

Another argument against the permeability of glass and other electrics is, that coated phials, it is said, standing upon electric substances, cannot be charged. This, however, seems to be very much exaggerated. A phial, though ever so perfectly insulated, will always receive a charge from a machine that acts very powerfully. Nay, it is certain, that though a phial is placed in such a manner, that both its knob and outside coating are in contact with the prime conductor, it will still receive a charge; much less indeed in this case than in any other, but still the shock will be perceptible.

In 1759, Mr Wilson read a paper before the Royal Society, in which the permeability of glass by the electric fluid was asserted. The experiments from which he deduced this conclusion were the following. He took a very large pane of glass, a little warmed; and holding it upright by one edge, while the opposite edge rested upon wax, he rubbed the middle part of the surface with his finger, and found both sides electrified *plus*. He accounted for this from the electrical fluid passing through the glass from his finger to the opposite side. But here Dr Priestley observes, that on Franklin's principles it ought to be so. If one side be rubbed by the finger, it acquires from it some electrical fluid. This being spread on the glass as far as the rubbing extended, repels an equal quantity of that contained in the other side of the glass, and drives it out on that side, where it stands as an atmosphere, so that both sides are found positively electrified. Mr Wilson also tried another experiment, which seemed more

N^o 112.

decisive than the former: Having by him a pane of glass, one side of which was rough and the other smooth, he rubbed it slightly on one side; upon doing which, both sides were electrified *minus*. This also Dr Priestley attempts to reconcile with Franklin's hypothesis. "As the electric fluid, contained in the glass (says he), is kept equal in both sides by the common repulsion; if the quantity in one side is diminished, the fluid in the other side, being less repelled, retires *inward*, and leaves that surface also *minus*." But here it is impossible to avoid observing, that Dr Priestley's own words, in the strongest manner, militate against the doctrine he means to establish. The quantity of fluid in one side being diminished, that on the other, he says, *retires inward*. But into what does it retire? if into the substance of the glass, then the glass is undoubtedly permeable by it; and this is the very thing which Dr Priestley argues against.

III. "The electric matter violently repels itself, and attracts all other matter." The proofs of this position are chiefly derived from the following experiment, and others of a similar kind. Let a smooth piece of metal be insulated, and bring an excited glass tube near one end of it. A spark of positive electricity will be obtained from the other end; after which, if the tube is suddenly removed, the metal becomes electrified negatively. Here, then, it is said, is a plain repulsion of one part of the electric fluid by another. That contained in the tube repels the fluid contained in the nearest end of the metal; of consequence it is accumulated in the other end, and when the tube is removed, the metal is found to be deprived of part of its natural quantity of electricity, or is electrified negatively.—On such experiments as this, however, it is obvious to remark, that we ought first to prove that positive electricity consists in an accumulation, and negative electricity in a deficiency, of the electric fluid. But while this is only *supposed*, it is impossible that any proofs drawn from the supposition can be conclusive.

IV. "By the excitation of an electric, the equilibrium of the fluid contained in it is broken, and one part is overloaded with electricity, while the other contains too little." This position is entirely hypothetical. No electrician hath yet explained, in a satisfactory manner, how the fluid is procured by the excitation of glass or any other electric substance. Dr Priestley, instead of giving an explanation, proposes several queries concerning it. Mr Cavallo tells us, that the act of excitation *pumps* as it were the electric fluid from the rubber, and consequently from the earth. He adds, "By what mechanism one body extracts the electric fluid from another, is not yet known. The celebrated Father Beccaria supposes, that the action of rubbing increaseth the capacity of the electric, *i. e.* renders that part of the electric which is actually under the rubber, capable of containing a greater quantity of electric fluid: hence it receives from the rubber an additional share of fluid, which is manifested upon the surface of the electric, when that surface is come out from the rubber; in which state it loses, or, as it were, contracts its capacity. Signior Beccaria's experiment to prove this supposition is the following. He caused a glass plate to be rubbed by a rubber applied on one side of the plate, while it was turning vertically; and holding at the same time a linen thread on the other side of the plate

Theory.

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The electric fluid cannot be proved repulsive of itself.

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Beccaria's hypothesis concerning excitation.

Theory. plate just opposite to the rubber, he observed that the thread was not attracted by that part of the glass which corresponded to the rubber, but by that which was opposite to the surface of the glass that had just come out from the rubber; which shows, that the fluid acquired by the glass plate did not manifest its power until the surface of the glass was come out from the rubber." But from this experiment it seems impossible to draw any conclusion concerning the capacity of glass either one way or other. It is evident, therefore, that whatever parts of Dr Franklin's hypothesis rest on this supposition concerning excitation, are entirely void of evidence.

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Whether the electric fluid pervades the substance of conductors. V. "Conducting bodies are permeable by the electric fluid through the whole of their substance, and do not conduct it merely over their surface." The proof most commonly adduced in favour of this position, is the following experiment. Take a wire of any kind of metal, and cover part of it with some electric substance, as rosin, sealing-wax, &c. then discharge a jar through it, and it will be found that it conducts as well with as without the electric coating. This, says Mr Cavallo, proves that the electric matter passes through the substance of the metal, and not over its surface. A wire, adds he, continued through a vacuum, is also a convincing proof of the truth of this assertion. Even here, however, the proof, if impartially considered, will be found very defective. It is a fact agreed upon by all philosophers, that bodies which to us are apparently in contact, do nevertheless require a very considerable degree of force to make them actually touch one another. Dr Priestley found that a weight of six pounds was necessary to press 20 shillings into close contact, when lying upon one another on a table. A much greater weight was necessary to bring the links of a chain into contact with each other. It cannot be at all incredible, therefore, that a wire, though covered with sealing-wax or rosin, should still remain at some little distance from the substance which covers it. The following experiments of Dr Priestley also seem to be much in favour of the supposition that the electric fluid passes chiefly over the surface of conducting substances.

"From the very first use of my battery (says he), I had observed a very black smoke or dust to arise on every discharge, even when no wire was melted; and the brass chain I made use of was of a considerable thickness. I observed, that a piece of white paper, on which lay the chain I was using to make the discharge, was marked with a black stain, as if it had been burnt, wherever it had touched it. I neglected the experiment, till, some time after, observing a very striking appearance of the same kind, I was determined to attend to the circumstances of it a little more particularly. I made my chain very clean, and wrapping it in white paper, I made a discharge of about 40 square feet through it, and found the stain wherever it had touched the paper. Some time after I wrapped the paper, in the same manner, round a piece of brass wire; but, making a discharge through it, saw no stain. To ascertain whether this appearance depended upon the discontinuity of the metallic circuit, I stretched the chain with a considerable weight, and found the paper on which it lay, as the shock passed

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through it, hardly marked at all. Finding that it depended upon the discontinuity, I laid the chain upon white paper, making each extremity fast with pins stuck through the links; and when I had made the discharge, observed that the black stains were directly opposite to the body of the wire that formed the chain, and not to the intervals, as I had sometimes suspected. A chain five feet four inches long, which weighed one ounce seventeen penny-weights four grains, lost exactly half a grain after each discharge.

"In making the mark above-mentioned, I once happened to lay the chain so as to make it return at a sharp angle, in order to impress the form of a letter upon the paper; and observed, that on the discharge, the part of the chain that had been doubled was displaced, and pulled about two inches towards the rest of the chain. At this I was surprised, as I thought it lay so, that it could not slide by its own weight. Upon this I repeated the experiment with more accuracy. I stretched the whole chain along a table, laying it double all the way, and making it return by a very sharp angle. The consequence always was, that the chain was shortened about two inches, and sometimes more, as if a sudden pull had been given to it by both the ends. Suspecting that the black smoke which rose at every discharge, might come, not from the chain, but from the paper, or the table on which it lay, and which was probably burnt by the contact of it, I let the chain hang freely in the air; but, upon making the discharge, I observed the same gross black smoke that had before risen from the paper or the table. Fig. 76. represents the spots made upon the paper by a chain laid over it. The breadth of the spots is about the mean thickness of the wire of the chain, and *a b* marks the place to which that part of the chain which returned was thrown back by the discharge.

"Being willing to try what would be the effect of laying the chain in contact with non-conductors, I dipped it in melted rosin till it had got a coating of considerable thickness. When it was quite stiff, I laid it carefully, without bending, upon white paper, and made the discharge through it. The rosin was instantly dispersed from all the outside of the chain, it being left as clean as if none had ever been put on. That with which the holes in the chain had been filled having been impelled in almost all directions, was beaten to powder; which, however, hung together but was perfectly opaque; whereas it had been quite transparent before this stroke. I next laid the chain upon a piece of glass, which was marked in the most beautiful manner wherever the chain had touched it; every spot the width and colour of the link. The metal might be scraped off the glass at the outside of the marks; but in the middle part it was forced within the pores of the glass. On the outside of this metallic tinge was the black dust, which was easily wiped off.

From these experiments it would seem, that the electrical flash had passed over the surface of the chain rather than through its substance; seeing it threw off the rosin with such extreme violence. The same thing appears from the manner in which electricity generally acts, which is not according to the solid contents of any substance, but according to the dimensions of its

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Theory.

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A chain shortened by the electric shock.

Plate CLXXVII.

Theory.

surface. It is not to be doubted, however, but that, where a great quantity of electric matter is made to pass along a very small wire, it will enter the substance of the metal. This appears from the possibility of melting wires by the force of electric batteries, and even totally dissipating them into small globules. To accomplish this, it is only necessary to connect the hook communicating with the outside coating of a battery, containing at least 30 square feet of coated surface, with a wire that is about one-fiftieth part of an inch thick and about two feet long. The other end of it must be fastened to one end of the discharging rod: this done, charge the battery; and then by bringing the discharging rod near its wires, send the explosion through the small wire, which by this means will be made red hot and melted, so as to fall upon the floor in different glowing pieces. When a wire is melted in this manner, sparks are frequently seen at a considerable distance from it, which are red hot particles of the metal, that, by the violence of the explosion, are scattered in all directions. If the force of the battery is very great, the wire will be entirely dispersed by the explosion, so that none of it can be afterwards found. If it is required to melt such particles as cannot easily be drawn into wires, ores, for instance, or grain-gold, they may be set in a train upon a piece of wax: they are then to be put into the circuit, and an explosion sent through them, which, if sufficiently strong, will melt them as well as the wires. If a wire is stretched by weights, and a shock is sent through it which renders it just red hot, the wire, after the explosion, is found to be considerably lengthened.

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Dr Franklin's hypothesis concerning positive and negative electricity cannot be proved.

VI. The last position on which Dr Franklin's theory depends, and which indeed may be called the foundation of the whole, is, "That positive electricity is an accumulation, or too great a quantity, of electric matter contained in a body; and negative electricity is when there is too little." Of this, however, there is not one solid proof; and all attempts that have hitherto been made to prove it, are only arguing in a circle, or proving the thing by itself. Thus, for instance, a body electrified positively, attracts one that is electrified negatively; because the first has too much, and the other too little, electric matter. But how do we know that one has too much, and the other too little, electricity? Because they attract each other. Again it has been proved, that when a phial is electrified positively, there is as constant a stream of fire from the outside coating, as there is from the conductor to the inside coating. Therefore, it is said, the outside of the glass has too little, and the inside too much, electricity. But how is this known to be the case? Because glass is impermeable by the electric fluid. And how is glass known to be impermeable? Because, in the above experiment, one side has too much, and the other too little, electricity. Thus in every instance, the arguments for Dr Franklin's hypothesis return into themselves, and no conclusion can be drawn from them. In the subsequent section, the nature of the electric fluid is particularly considered, where the improbability of its ever being accumulated in the substance of solid bodies will more plainly appear.

SECT. VI. *An Inquiry into the Nature of the Electric Fluid; with an Attempt to explain the principal Phenomena of Electricity, from the known Laws by which other Fluids are observed to act upon one another.*

Theory.

In making this inquiry, or indeed any other, it is proper to take for granted as little as possible. No position should be assumed as the basis of any reasoning whatever, except what has been proved by incontestable facts. In the present case, therefore, it is sufficient to assume as a fact what hath been already proved by innumerable experiments, namely, That the air, the earth, and sea, all contain great quantities of electric fluid. The question which most naturally suggests itself when this is once admitted, is, Whence hath the electric fluid come? is it essentially inherent in these bodies, or hath it come from without? This cannot be resolved, without considering the nature of the fluid itself, and whether it is analogous to any other which is more generally known.

§ 1. *Proofs of the Identity of the Electric Fluid and Elementary Fire or Light of the Sun.*

THE similarity between the electric matter and fire, naturally suggested to the first observers, that it was no other than elementary fire, which pervaded all substances, as we have already mentioned. This, however, was objected to; and the principal objection was, that though the electric matter emitted light, and had the appearance of fire, it nevertheless wanted its most essential quality, namely, *burning*. In particular, the blast which comes from an electrified point, feels cold instead of being hot; and where great quantities of the fluid are forced with violence through certain substances, and thus set them on fire, it was thought that the fire might be occasioned by the internal commotion excited among their small particles. This objection, however, seems now to be totally removed. The dispute concerning the preferable utility of pointed or knobbed conductors for securing buildings from lightning, occasioned the fitting up of a more magnificent apparatus than had ever appeared before. An immense conductor was constructed at the expence of the board of ordnance, and suspended in the *Pantheon*. It consisted of a great number of drums covered with tin-foil, which formed a cylinder of above 155 feet in length, and more than 16 inches in diameter; and to this vast conductor were occasionally added 4800 yards of wire. The electric blast from this machine fired gun-powder in the most unfavourable circumstances that can be imagined, namely, when it was drawn off by a sharp point, in which case it has generally less force than in any other. The method of doing this was as follows. Upon a staff of baked wood a stem of brass was fixed, which terminated in an iron point at the top. This point was put into the end of a small tube of Indian paper, made somewhat in form of a cartridge, about an inch and a quarter long, and two-tenths of an inch in diameter. When the cartridge was filled with common gun-powder, unbruised, a wire communicating with the earth was then fastened to the bottom of the brass stem. The charge in the great cylinder being continually kept up by the motion of the wheel, the top of the cartridge was brought
ery

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Gun-powder fired by the electric blast.

Theory. very near the drums, so that it frequently even touched the tin-foil with which they were covered. In this situation a small faint luminous stream was frequently observed between the top of the cartridge and the metal. Sometimes this stream would set fire to the gun-powder the moment it was applied; at others, it would require half a minute or more before it took effect. But this difference in time was supposed to be owing to some small degree of moisture in the powder or the paper, which was always unfavourable to the experiment. Tinder was fired much more readily.

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Action of
the electric
matter and
light com-
pared.

As it therefore appears, that the electric fluid, when it moves through bodies either with great rapidity, or in very great quantity, will set them on fire, it seems scarce disputable, that this fluid is the same with the element of fire. For further proofs of this opinion, which is now adopted by some very eminent philosophers, see the articles FIRE and HEAT. See also CHEMISTRY-Index. This being once admitted, the source from whence the electric fluid is derived into the earth and atmosphere, must be exceedingly evident, being no other than the sun, or source of light itself. The vast quantity of light which continually comes from him to the earth must of necessity be absorbed by that opaque body, at least in great part. It is impossible it can remain there, because there is a perpetual succession of new quantities coming from the sun. It must be observed, however, that as this fluid receives a great number of different directions after once it enters the earth, it cannot appear in its natural form of fire or light, till it receives a new motion similar to what it had when proceeding from the sun. The solar light only burns, or produces heat, when diverging from a centre, or converging towards one. The heat is always greatest at the central point; and even there, no heat is produced except where the light passes through a resisting medium. In those cases likewise the electric fluid burns. When discharged with violence from an electrified bottle, it flies out on all sides, and then will fire gun-powder, or other combustible substances. The same thing it will do when converging towards a point, if in sufficient quantity, as was observed in the experiment with the large conductor above mentioned. But when the electric fluid neither meets with any considerable resistance, diverges from a centre, nor converges towards one, it is almost always invisible, and without heat. A most remarkable proof of this we have, even when a vast quantity of electric matter is forced to go through a very small wire. Dr Priestley tells us he had once an opportunity of observing what part of the conductors which form an electric circuit are most affected by the explosion. Upon discharging a battery of 51 square feet thro' an iron wire nine inches long, the whole of it was glowing hot, and continued so for some seconds. The middle part grew cool first, while both the extremities were sensibly red. When the wire was afterwards examined, both the extremities were found quite melted; an inch or two of the part next to them was extremely brittle, and crumbled into small pieces on being handled; while the middle part remained pretty firm, but had quite lost its polish, so that it looked darker than before. This is precisely what would have happened, had both ends been put into a common fire.

Theory. We are very sure, that the same quantity of electric matter passed through the middle of the wire, that entered one end of it and went out at the other. Why then did it not produce the same degree of heat in the middle that it did at each end? The reason is plain: At one end it was in a state of *convergence* from the battery to the point of the wire; at the other, it was in a state of *divergence* from the point of the wire to the battery. At the points, therefore, an intense heat was produced; but in the middle, where the fluid neither converged nor diverged, but moved forwards in a parallel direction, the heat was much less. Now we know that this is the case with the solar light itself. At the focus of a burning-glass there is an intense heat both where the convergence ends and the divergence begins. But where this divergence considerably ceases, and the motion of the light becomes more parallel, the heat is vastly diminished. The case is the same with a common fire, and with all burning bodies; for heat never acts but from a centre, and is always greatest at the central point. It is true, that we can never produce electric fire without at the same time producing a violent shock exceedingly different from the *burning* of common fire. But the reason of this is, that we cannot produce a divergence in a stream of electric matter, without at the same time giving it such a motion in some other direction, that its impetus becomes very perceptible. If it was in our power to make the flash produced by an electric bottle keep its place, we cannot suppose that any shock, or other sensation than heat, would be felt. But there is no possibility of hindering it from flying with prodigious celerity from one side of the bottle to the other. Therefore, as it is neither in a state of divergence nor convergence, except where it comes out from and enters into the bottle, no sensation is perceived except what arises from its change of place; and hence it is said, that the electric matter hath no heat.

§ 2. *The Identity of Electric Matter and Light farther considered; with some positive Proofs, that Electric Substances are actually penetrated by the Electric Fluid.*

THE only objection of any strength which can arise to the identity of the electric fluid and light is, the surprising ease with which the latter penetrates glass, and the seeming stop which is put to the motions of the former when a piece of glass or any other electric substance is presented to it. Here, however, it must be observed, that light, as proceeding from a luminous body, must be regulated by very different laws from light which is absorbed by opaque bodies, and consequently subjected to motions quite different from what it originally had. Water, the only fluid with which we are very well acquainted (tho' all others we know seem to be regulated by the same laws), is capable of two very different motions. The one is a rectilinear one, by which great quantities of it run from one place to another. The other is not so easily explained. It may, however, be very readily observed, by throwing a small stone into a pool of water. A great number of concentric circles will be propagated from the place where the stone fell, as from a centre, which will gradually grow larger and larger. If another stone is thrown in at some distance, similar circles will proceed from the place where it fell. These will meet with the former,

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Objection
concerning
the impenetrability
of glass answered.

^{Theory.} and cross them without interfering with each other in the least. It is certain, however, that two streams of water rushing opposite to one another, would shatter and destroy each other. If, therefore, there is a difference in the motion of the electric fluid when it burns, and when it does not (which there certainly is), we may easily suppose it possible, that glass should obstruct one kind of motion and not another: In which case, the glass would seem to be permeable by the fluid when manifesting itself by the first kind of motion, and not so when it manifests itself by the other.

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Surprising
experi-
ments con-
cerning the
transparen-
cy of bo-
dies.

It hath commonly been thought, that the transparency of bodies depends upon the rectilinear direction of their pores, and opacity upon the situation of them in some other direction. Electrical experiments, however, have shown that this is not the case. Sealing-wax and pitch are as opaque bodies as we are acquainted with; yet in Mr Hauksbee's experiments, mentioned n^o 4. these substances were both rendered transparent by the action of the electric fluid. These experiments are confirmed by some others still more surprising, mentioned by Dr Priestley. See also below Sect. VIII. One was made by S. Beccaria. He discharged an electric shock through some brassdust sprinkled between two plates of sealing-wax. The whole was perfectly luminous and transparent. The most extraordinary experiment, however, was made by Dr Priestley himself, of which he gives the following account. "I laid a chain in contact with the outside of a jar lightly on my finger, and sometimes kept it at a small distance by means of a thin piece of glass; and, if I made the discharge at the distance of about three inches, the electric fire was visible on the surface of the finger, giving it a sudden concussion, which seemed to make it vibrate to the very bone; and when it happened to pass on that side of the finger which was opposite to the eye, the whole seemed perfectly transparent in the dark."

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Consequen-
ces from
them.

Experiments of this kind, though they have not hitherto been much pursued by electricians, seem to be more worthy of notice than almost all others. One consequence which may be derived from them is, that there is in bodies, whether electric or non-electric, a certain subtle medium, on the motion of which transparency depends. That is, when the medium is at rest, the body is opaque; but when set in motion, it becomes transparent. This motion, we see, may be given in two different ways. One is by simple electrification *in vacuo*, according to Mr Hauksbee's experiments. The other is, by sending the flash of an electrified bottle over their surface. In Dr Priestley's experiment, he could determine the motion to be of the vibratory kind; and hence we may easily conclude, that some bodies may be constructed in such a manner, that they are capable of transmitting the vibrations of this fluid, but not any other kind of motion. Such kinds of bodies will be naturally transparent: but others, whose particles are disposed in such a manner that the vibrations cannot be propagated thro' them without considerable violence, are naturally opaque. The question then only is, What is this subtle medium, the vibrations of which occasion transparency? It is scarce possible to answer this question in another manner than by saying, that it is the electric fluid. That it is this fluid which gives the power to electric sub-

stances, has never been denied. That the motion of this fluid along the surfaces of bodies throws another fluid within them into vibrations, is also evident from the experiments above mentioned. All bodies are confessed to have much of this fluid in their pores: therefore, if a quantity of the same matter passes over the surface of any body, it must affect what is within its substance with a motion of some kind or other; because it affects that which lies on the outside, and this cannot fail to affect all the rest. This motion Dr Priestley's experiment determines to be of the vibratory or tremulous kind; and, indeed, it is natural to think it should be so. The vibrations of the electrical fluid, therefore, conduct light through opaque bodies. But whatever fluid is conducted by the vibration of another, must itself also vibrate while it is so conducted. Light, therefore, vibrates when emitted from luminous bodies. In the present case, these vibrations are originally occasioned by the electric flash. They are conducted thro' opaque bodies by the vibrations of the electric fluid. The air is also full of the same fluid. The air is naturally transparent; but we have seen that transparency consists only in the easy transmission of a vibratory motion of the electric fluid. The light, therefore, is perpetually conducted by means of the vibrations of this fluid: therefore, the vibrations of the electric fluid and light are the same; for no two fluids are always capable of setting one another in motion precisely in the same manner, unless their nature is in all respects exactly the same.

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Light pro-
ved to be a
vibration of
the electric
fluid.

These experiments seem in the strongest manner to prove the identity of the electric fluid and light, and that both are transmitted through electric as well as other substances. The reason, therefore, of the seeming stop, which is observed in our electrical operations by the intervention of glass, is, that in all artificial electricity, the fluid has a very considerable progressive motion, which cannot be easily propagated through the solid substance of any body, especially where there is a pretty strong resistance on the other side; which shall afterwards be shown to be the case with this fluid when passing through electric substances.

§ 3. Of the Passage of the Electric Fluid over the Surface, and through the Substance, of different Bodies.

DR PRIESTLEY hath made many very curious experiments concerning the discharging of electric shocks over the surface of different bodies; and finds, that this means a battery may be made to discharge itself at a much greater distance than it would do if sent directly through the air. The experiments were begun with ice; and he first accidentally discovered, that, when the shock of a common jar was discharged on a plate of ice, it would sometimes run over the surface and strike the chain directly on the other side. With a single jar, however, the distance was not much greater than what it would have passed over in the usual way; but, with a battery, it exceeded the usual distance in a very great degree. Endeavouring to make a circular spot, such as he had formerly made on metals, upon a flesh, piece of raw flesh, he took a leg of mutton, and laying the chain that communicated with the outside of the battery over the shank, he took the explosion on the outward membrane, about seven inches from the chain; but was greatly surprised to observe the electric fire not

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Dr Priest-
ley's experi-
ments
with ice;

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With raw
flesh;

Theory

to enter the flesh, but to pass in a body along the surface of it to come to the chain. Thinking that this might be occasioned by the fatty membrane on which the explosion was made, he again laid the chain in the same manner over the shank, and took the explosion upon the muscular fibres, where they had been cut off from the rest of the body; but still the fire avoided entering the flesh, made a circuit of near an inch round the edge of the joint, and passed along the surface to come to the chain as before, though the distance was near 11 inches. Imagining that this effect was promoted by the chain lying lightly on the surface of the flesh, and therefore not actually in contact with it, he took another explosion upon the hook of the chain, which was thrust into the flesh. On this the fire entered the mutton; and as he held it in his hands, both his arms were violently shocked up to his shoulders.

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With water;

The Doctor next determined to try the effect of different conducting substances in the same manner; and of these water was the most obvious. "Next day, (says he) I laid a brass rod communicating with the outside of the battery, very near the surface of a quantity of water (to resemble the chain lying upon the surface of the flesh, without being in contact with it), and, by means of another rod furnished with knobs, made a discharge on the surface of the water, at the distance of several inches from any part of the rod; when the electric fire struck down to the water, and, without entering it, passed visibly over its surface till it arrived at that part of the rod which was nearest the water, and the explosion was exceedingly loud. If the distance at which I made the discharge exceeded seven or eight inches, the electric fire entered the water, making a beautiful star upon its surface, and yielding a very dull sound. When I first made this experiment of the electric flash passing over the surface of water, I thought it necessary, that neither the piece of metal communicating with the outside, nor that communicating with the inside, of the jars, should touch the water immediately before the discharge. But I afterwards found, that the experiment would answer, tho' either, or even both of them, were dipped in the water: for, in this case, the explosion would still prefer the surface to the water itself, if the distance was not very great; and would even pass at a greater distance along the surface, when there was a nearer passage from one rod to the other in the water."

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With many other bodies.

He afterwards tried to pass the electric flash over the surfaces of a great number of different bodies, but found it impossible with many of them. He therefore imagined that this property of conducting a shock over its surface was peculiar to water and raw flesh. It was found, however, that the flash passed over the surface of a touch-stone, and likewise over a piece of the best kind of iron ore, exceedingly smooth on some of its sides. The piece was about an inch thick, and three inches in its other dimensions. The full charge of a jar of three square feet would not enter it. The explosion passed over the surface of oil of vitriol, with a dull sound and a red colour; but in all other cases, if it passed at all, it was in a bright flame, and with a report peculiarly loud. It passed over the surface of the most highly rectified spirit of wine without firing it; but when too great a distance was taken,

the electric fire entered the spirit, and the whole was in a blaze in a moment.

Theory

This was the case when such substances were employed as are but indifferent conductors of electricity; raw flesh, for instance, water, &c. When good conductors were used, such as charcoal of different kinds, no remarkable appearances were produced. So far was the shock from passing visibly over the surface of any metal, that, if the distance through the air, in order to a passage through the metal, was ever so little nearer than the distance between the two surfaces, it never failed to enter the metal; so that its entering the surface of the metal, and its coming out again, seemed to be made without obstruction. If as much water was laid on a smooth piece of brass as could lie upon it, it would not go over the surface of the water, but always struck thro' the water into the metal. But if the metal lay at any considerable depth under the water, it would prefer the surface. It even passed over three or four inches of the surface of water as it was boiling in a brass pot, amidst the steam and bubbles, which seemed to be no hindrance to it. Animal fluids, however, of all kinds, seemed peculiarly to favour this passage of the electric matter over their surface; and the report of these explosions was manifestly louder than when water was used. In all cases of this kind, the report was considerably louder than when the discharge was made in the common way. The explosions were observed by persons out of the house, and in a neighbouring house, very much to resemble the smart cracking of a whip. "But (says Dr Priestley) the sound made by these explosions, though by far the loudest that ever I heard of the kind, fell much short of the report made by a single jar, of no very great size, of Mr Rackstraw's; who says, that it was as loud as that of a pistol." He also observes, that when the electrical explosion does not pass over the surface of the water, but enters it, a regular star is made upon the surface, consisting of ten or a dozen rays: and what is very remarkable, those rays which stretch towards the brass rod that communicates with the outside of the battery are always longer than the rest; and if the explosion is made at such a distance as to be very near taking the surface, those rays will be four or five times longer than the rest, and a line bounding the whole appearance will be an ellipsis, one of whose foci is perpendicularly under the brass knob with which the discharge is made.

When an electric battery is discharged upon smooth pieces of metal, the effects are very different from any of those we have yet mentioned. Dr Priestley having constructed some large batteries, determined to try what would be the effects of a very great electric power discharged upon metals and other substances; and, in the course of his random experiments, he made the following discoveries. "June 13. 1766 (says he), after having discharged a battery of about 40 square feet with a smooth brass knob, I accidentally observed upon it a pretty large circular spot, the centre of which seemed to be superficially melted, in a great number of dots; larger near the centre, and smaller at a distance from it. Beyond this spot was a circle of black dust which was easily wiped off: but what I was most struck with was, that after an interruption of melted places, there was an entire and exact circle of shining dots, consisting of places superficially melted like those at the

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Circular spots produced by electrical explosions.

Theory.

the centre. The appearance of the whole, exclusive of the black dust, is represented Plate CLXXVII. fig. 75. n^o 1.

"June 14th, I took the spot upon smooth pieces of lead and silver. It was in both cases like that on the brass knob; only the central spot on the silver consisted of dots disposed with the utmost exactness, like radii from the centre of a circle, each of which terminated a little short of the external circle. I took the circular spot upon polished pieces of several metals with the charge of the same battery, and observed that the cavities in some of them were deeper than in others; as I thought in the following order, beginning with the deepest, tin, lead, brass, gold, steel, iron, copper, silver. I will not be positive as to the order of some of the metals; but silver was evidently not affected a fourth part so much as gold, and much less than any of the others. The circles were marked as plain, but the impression was more superficial.

"I also made the explosion between a piece of lead just solid after melting, and another smooth piece that I had kept a considerable time. The piece of fresh lead was melted more than the other, but there was no other difference between them. The semimetals, as bismuth and zinc, received the same impression as the proper metals; being melted nearly as much as iron. I made three discharges between a piece of highly polished steel and a piece of very smooth iron, and in all cases thought the steel was more deeply melted than the iron.

"Presently after I had observed the single circle, I imagined, that, whatever was the cause of the appearance, it was not improbable but that two or more concentric circles might be procured, if a greater quantity of coated glass was used, or perhaps if the explosion was received upon metals that were more easily fused than brass. Accordingly, June 27, taking the moderate charge of a battery, consisting of about 38 square feet, upon a piece of tin, I first observed a second outer circle, at the same distance from the first, as the first was from the central spot. It consisted of very fine points hardly visible, except when held in an advantageous light; but the appearance of the whole was very beautiful, and was such as is represented Plate CLXXVII. fig. 75. n^o 2.

"Having hitherto found the circles the most distinct on metals that melt with the least degree of heat, I soon after procured a piece of that composition which melts in boiling water; and having charged 60 square feet of coated glass, I received the explosion with it, and found three concentric circles; the outermost of which was not quite so far from the next to it, as that was from the innermost. All the space within the first circle was melted; but the space was very well defined, and by no means like a central spot, which in this case was quite obliterated. The appearance of these three concentric circles is represented Plate CLXXVII. fig. 75. n^o 3. The distance at which the discharge was made occasioned no difference in the diameter of these circular spots. When, by putting a drop of water upon the brass rod communicating with the inside of the battery, I made the discharge at the distance of two inches; the spot was just the same as if it had been received at the distance of half an inch, *i. e.* about a quarter of an inch in diameter. Attempting to send an electric

shock over the surface of quicksilver or melted lead, I found that it would not pass; though neither of the rods with which the discharge was made touched the metals. A dark impression was made on the surfaces of both the quicksilver and the lead of the usual size of the circular spot; and remained very visible notwithstanding the state of fusion in which the metals were."

§ 4. *The Electric Fluid moves through the Substance of Electrics, though with difficulty. In most Cases, it passes over the Surface of good Conductors.*

THIS will appear from a consideration of the phenomena above mentioned, and some others. The electric most universally present is *air*. That the fluid pervades its substance is evident to our eye-sight; for if a pointed body is placed on the prime conductor, and at the same time the cylinder is briskly turned, a continual stream of blue fire will be observed to issue from the point. This is undoubtedly the fluid itself made visible by the resistance it meets with from the air. That the electric fluid in this case pervades the air to a considerable distance, is also evident from the different methods by which the air of a room may be electrified. One method is that above mentioned: One or more needles are fixed on the prime conductor, which is kept strongly electrified for about 10 minutes. If, afterwards, an electrometer is brought into the room, the air will show that it has received a considerable quantity of electricity; for the balls will separate, and continue to do so even after the apparatus has been quite removed out of the room. Another method of electrifying the air is to charge a large jar and insulate it; then connect a sharp-pointed wire, or a number of them, with the knob of the jar; and make a communication from the outside coating to the table. If the jar is charged positively, the air of the room will likewise soon become electrified positively; but if the jar is charged negatively, the air will also become negative. To this it may be replied, that the air is always full of conducting substances, and that by means of them the electricity is propagated from one part of the air to another. But whether this is the case or not, it is certain that the air, notwithstanding all the conducting substances it may contain, is in fact an electric, and capable of receiving a charge like glass or any other electric substance. To this purpose there is a very curious experiment made in the following manner. Take two

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Methods of
electrifying
the air of a
room.

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To charge
a plate of
air.

in-

Theory

instantly be discharged from the lower one, if any conducting substance is presented to it. By continuing to give sparks to the upper board, and to take them from the lower one, the air between them will at last become charged like a piece of glass; and if a communication is made between them, they will explode, give the shock, &c. like glass.

In this experiment it seems impossible to deny that the air is penetrated by electric fluid. The distance of an inch is so small, that it must appear ridiculous to say that this space is penetrated only by a *repulsive power*, when in other cases we plainly see the fluid penetrating it to three or four times that distance. The flat surface of the boards indeed makes the motion of the electric fluid through the plate of air gradual and equal, so that it is not seen to pass in sparks or otherwise; but this is necessary to its receiving a charge, as will be afterwards explained.

If one electric substance is penetrable by the electric fluid, we must be led strongly to suspect at least, that all the rest are so too. That resin, pitch, sealing-wax, &c. are so, hath been already proved; and from thence, if we reason analogically, we must conclude, that glass is likewise penetrable by it. A very strong additional proof of this is, that the electric shock cannot be sent over the surface of glass. If this substance was altogether impenetrable to the fluid, it is natural to think, that it would run over the surface of glass very easily. But instead of this, so great is its propensity to enter, that a shock sent through between two glass plates, if they are pressed pretty close together, always breaks them to pieces, and even reduces part of them to a powder like sand. This last effect cannot be attributed to any other cause than the electric fluid entering the pores of the glass; and, meeting with resistance, the impetus of its progressive motion violently forces the vitreous particles asunder in all directions.

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Accounts
of globes
burst by
electrical
operations.

To this violent impetus of the electric fluid, when once it is set in motion, we may also with some probability ascribe the bursting of electric globes, both such as are made of glass, and other materials, in the act of excitation. Dr Priestley hath given several instances of this accident. "The fragments (says he) have been thrown with great violence in every direction, so as to be very dangerous to the bystanders. This accident happened to Mr Sabbatelli in Italy, Mr Nollet in France, Mr Beraud at Lyons, Mr Boze at Wittemberg, Mr Le Cat at Rouen, and Mr Robein at Rennes. The air in the inside of Mr Sabbatelli's globe had no communication with the external air, but that of the Abbe Nollet had. This last, which was of English flint glass, had been used for more than two years, and was above a line thick. It burst like a bomb in the hands of a servant who was rubbing it, and the fragments, none of which were above an inch in diameter, were thrown to a considerable distance. The Abbe says, that all the globes which were burst in that manner, exploded after five or six turns of the wheel; and he ascribes this effect to the action of the electric matter making the particles of glass vibrate in a manner he could not conceive.

"When Mr Beraud's globe burst (and he was the first to whom this accident was ever known to happen), he was making some experiments in the dark on the

8th of February 1750. A noise was first heard as of something rending to pieces; then followed the explosion; and when the lights were brought in, it was observed that those places of the floor which were opposite to the equatorial diameter of the globe were strewed with smaller pieces, and in greater numbers, than those which were opposite to other parts of it. This globe had been cracked, but it had been in constant use in that state above a year; and the crack had extended itself from the pole quite to the equator. The proprietor ascribed the accident to the vibrations of the glass, and thought the crack had some way impeded these vibrations. When Mr Boze's globe broke, he says that the whole of it appeared, in the act of breaking, like a flaming coal. Mr Boulanger says, that glass globes have sometimes burst like bombs, and have wounded many persons, and that their fragments have even penetrated several inches into a wall. He also says, that if globes burst in whirling by the gun-barrel's touching them, they burst with the same violence, the splinters often entering into the wall. The Abbe Nollet had a globe of sulphur which burst as he was rubbing it with his naked hands, after two or three turns of the wheel, having first cracked inwardly. It broke into very small pieces, which flew to a great distance, and into a fine dust; of which part flew against his naked breast, where it entered the skin so deep, that it could not be got off without the edge of a knife."

From these appearances we must necessarily conclude, not only that the electric fluid moves within the substance of electric bodies, but that it sometimes moves with extreme violence; so that its repulsive power separates even the minutest particles from each other; and this could not happen without a thorough penetration of the electric body. It seems more difficult to prove, that the electric matter does not generally pass directly through the substance of metals, but over their surface. A little consideration, however, will show, that this must very probably be the case. If we compare Dr Priestley's experiments on metals related in § 3. with the effects of the solar light collected in the focus of a burning-glass upon the same metals, we shall find a considerable degree of resemblance. Under the article BURNING-GLASS, it is observed, that, notwithstanding the prodigious power of that concave mirror with which Mr Macquer melted platina, all bodies did not melt equally soon in the focus. In particular, polished silver, though a very fusible metal, did not melt at all. It is not to be doubted, that this was owing to the complete reflection of the light by the silver; and had polished pieces of all the metals been tried, it is equally certain, that the difficulty of melting them would have been found exactly proportioned to their reflective power. Something like this happened with Dr Priestley; for silver was less touched by the electric explosion than any other metal. The violent progressive motion of the fluid indeed forced it into the metal, but at the same time the reflective power of the silver hindered it from going so deep as it had done in the others. The case was still more evident when melted lead and quicksilver were used. These have a very great reflective power; and though by reason of the extreme violence wherewith the fluid struck them, part of their substance might naturally have

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Proofs of
the electric
fluid's passing
over
the surface
of conductors.

Theory.

have been supposed to be dissipated in the hard metals, yet we find this was not the case. Only a black spot was made on the surface, and the fluid was immediately dispersed, most probably over the surface of the metal.

It is not indeed easy to bring a decisive proof in favour of this hypothesis. The extreme subtilty, and, in most cases, invisibility, of the electric fluid, render all reasoning about its motions precarious. It is incredible, however, that this fluid should pass through the very substance of metallic bodies, and not be in the least retarded by their solid particles. In those cases, where the solid parts of metals are evidently penetrated, i. e. when wires are exploded, there is a very manifest resistance; for the parts of the wire are scattered about with violence in all directions. The like happened in Dr Priestley's circles made on smooth pieces of metal. Part of the metal was also dispersed and thrown off, for the circular spots were composed of little cavities. If therefore the fluid was dispersed throughout the substance; and not over the surface of the metal, it is plain, that a wire whose diameter was equal to one of those circular spots, ought also to have been destroyed by an explosion of equal strength sent through it. But this would not have been the case. A wire whose diameter is equal to one of those circular spots represented in n^o 1, 2, 3. fig. 75. Plate CLXXVII. would without injury conduct a shock much greater than any battery hitherto constructed could give. It is most probable therefore, that though violent flashes of electricity, which act also as fire, will enter into the substance of metals and consume them; yet it immediately disperses itself over their surface, without entering the substance any more, till being forced to collect itself into a narrow compass it again acts as fire.

In many cases, the electric fluid will be conducted very well by metals reduced to a mere surface, so that we can scarce say they have any thickness at all. A piece of white paper will not conduct a shock without being torn in pieces, as it is an electric substance. But a line drawn upon it with a black-lead pencil will safely convey the charge of several jars. It is impossible we can think that the fire here passes through the substance of the black-lead stroke. It must run over its surface; and if we consider some of the properties of metals, we shall find, that there is very great reason for believing that their conducting power lies at their surface.

The metals are, of all terrestrial substances, those which reflect the light most powerfully. Sir Isaac Newton hath shown that this reflective power they have not from their substance as metals, but from what he calls a *repulsive power*, spread equally over their surface. The existence of this repulsive power hath already been taken notice of in several instances, particularly in that of a chain, whose links cannot be brought into contact with each other without a considerable degree of force. It is exceedingly probable, that the repulsive power by which the links of the chain are kept asunder, and that by which the rays of light are reflected, are one and the same. As the electric fluid is known to pervade all substances, and metals as well as others, it seems also probable, that the repulsive and reflective power on the substance of metals is no other than the electric fluid itself in a quiescent

N^o 112.

Theory.

state. Perhaps it may be thought absurd to ascribe the reflection of light to a substance of such extreme fluidity and tenuity as the electric fluid is; but we find that the vacuum of an air-pump, a medium of nearly equal tenuity with the electric fluid (as will elsewhere be proved), is in some cases capable of reflecting light very powerfully. Now it is certain, that nothing can be supposed to give such an easy passage to the electric fluid as itself; because it is the thinnest and most subtle of all the substances we know, and therefore must make the least resistance. Hence the fluid slides over the surface of a piece of metal with surprising ease; and when a large surface of metal is electrified, the effect is proportionable to the extent of it, because all that quantity of electric fluid which is spread over the surface, easily receives the motion communicated by the electrical machine.

The vacuum of an air-pump is found to be a very good conductor, and by means of it the motion of the fluid is rendered visible. Hence this is brought as an argument that the electric fluid *always* passes through the substance of conductors. That it doth so in some cases is indeed very evident, but it then meets with considerable resistance; and, even in the present instance, the passing through the vacuum of an air-pump, where it is opposed by a considerable quantity of the same kind of fluid, gives such a considerable resistance, that it will prefer a passage along a metalline rod to one through a vacuum. With regard to charcoal, and other conductors of that kind, as they are very porous, and likewise composed of fine spiculæ, it is probable the fluid may run along the surface of the spiculæ, and at the same time through the substance of the coal. Even in passing over the best conductors, however, this fluid meets with some resistance, as it will prefer a short passage through the air to a long one through the best conductors.

§ 5. *The exceeding great Velocity and Strength of the Electric Fluid are not owing to a repulsive Power among its Particles, but to the mutual Action of the Air and Electric Fluid upon themselves and one another.*

THE arguments for a repulsive power existing between the particles of the electric fluid are very inconclusive. Some of them have been already taken notice of. The strongest is that drawn from the appearance of the electric fire issuing from a point, or from any body highly electrified. In the open air this diverges excessively; and very often divides into several distinct rays, which by avoiding each other seem to be violently repulsive. That they are not so in reality, however, is plain from the appearance they have in *vacuo*; when, the resistance of the atmosphere being taken off, the electric light would have room to spread more widely. Fig. 27. Plate CLXXIV. represents an exhausted receiver with an electrified wire discharging a stream of this fluid from itself, by means of its communication with a machine. If the electric matter then was really elastic, or endowed with a power repulsive of itself, it is impossible it could pass in an uninterrupted column through an exhausted receiver as in the figure. A column of air, if blown swiftly through the orifice of a small pipe, will go forward a considerable way, if it is counterbalanced by air like itself on every side. But if such a column enters a vacuum, what

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Electric fluid shown to be not repulsive of itself.

Theory. what we call its *elasticity*, occasions it to be dissipated in a moment, and equally diffused through the whole exhausted receiver. But this by no means happens to the electric fluid; for even the small divergency represented in the figure seems entirely owing to some quantity of air left in the air-pump. Dr Watson, by means of a long bent tube of glass filled with mercury, and inverted, made all the bended part which was above the mercury the most perfect vacuum that could be made. This vacuum he insulated; and one of the basins of mercury being made to communicate with the prime conductor, when some non-electric substance touched the other, the electric matter pervaded the vacuum in a continued arch of lambent flame, and, as far as the eye could follow it, without the least divergency. From these experiments it appears, that there is in the vacuum of an air-pump, as well as in the Torricellian vacuum, a fluid of nearly the same density with the electric one: that the electric fluid is not repulsive of itself, but is resisted by the atmosphere; and therefore all appearances of electrical light are less bright *in vacuo* than in the open air; because, the more resistance the matter meets with, the brighter is the flash.

Plate
CLXXIV.

Thus, as long as a stream of electric fluid is moved through a medium of an equal density with itself, the equable pressure of the fluid all round will keep the luminous streams from diverging; but if the pressure is taken off from any part of the receiver, the pressure of the rest will immediately force the stream to that place, as represented fig. 28. That it is by a pressure of this kind, and not by any obscure *attractive power*, that this is occasioned, will be rendered very probable from the following example. Suppose a pot or kettle is boiling violently over a fire, and in such a situation that there is very little agitation in the surrounding air. The equal pressure of the atmosphere will then force the steam straight upwards in a cylindrical column; but if any object is brought near the edge of the pot, so that the pressure of the atmosphere is taken off on one side, the steam will be directly forced upon that body, or seemingly attracted by it. The electric matter therefore, being capable of having its motions resisted by the air, must immediately fly to that place where the resistance is least; but in the case above mentioned, this is best done by applying a conducting substance to the side of the receiver, or one along which the fluid can run downward to the earth. This, however, will be more fully explained when we speak of the phenomena of the Leyden phial.

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Origin of
the prodigious power
of electricity.

From this simple principle, *viz.* that fluids impelled by any force will always tend towards that place where there is the least resistance, most of the phenomena of electricity may be explained. The first thing to be considered is, From what source it originally derives the astonishing agility and strength displayed in its motions. If it is granted that the electric fluid is the same with the solar light, the ultimate cause of its momentum must be the power by which the light of the sun is emitted. As this power extends through regions of space which to our conceptions are truly *infinite*, so must the power itself be; and it is plain, that by its equable action all round, throughout the whole space thro' which the sun's light is propagated, the pressure of it upon all bodies must be equal all round, and con-

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sequently it can neither move them one way nor another. But if, by the intervention of some other power, the pressure is lessened upon any particular part, a current of electric matter will set towards that part, with a force exactly proportioned to the diminution of the pressure. Thus, in the common experiments of the air-pump, when the air is exhausted from a glass vessel, the pressure of the superincumbent atmosphere is directed towards every part of the glass; so that if it is of a flat square shape, and not very strong, it will certainly be broken. But after the air is exhausted, the vessel is discovered to be full of another subtle fluid of the same nature with the electric one *. If this could also be extracted from the vessel, the pressure on its sides would necessarily be much greater, because not only the atmosphere, but the whole surrounding ether or electric matter, would urge towards the place; and it is not probable, that this pressure could be resisted by any terrestrial power whatever. The momentum of the electric matter therefore, in our experiments, depends on two causes, *viz.* the pressure of the atmosphere upon the electric matter, and the pressure of one part of this matter upon another. The celerity with which it moves may be explained from its parts lying in contact with each other throughout the wide immensity of space. Hence the great tendency of the fluid to circulate; because, from whatever point a stream of it is sent off, there the pressure is lessened, and the stream, finding no place empty for its reception, must necessarily have a tendency to return to the place from whence it came, as there it meets with the least resistance; and hence, when a passage is opened for it, by which it can return to this point, it is urged thither with great violence, the equable pressure is restored, and the artificial motion ceases.

Theory.

See
Vacuum.

§ 6. *The Manner in which an Electric Substance becomes excited, or diffuses its Electric Virtue.*

THIS will easily appear from considering the means taken for the excitation of a common cylinder for electric experiments. The glass is a substance, as we have already seen, into which the electric matter is very apt to enter. To the surface of the glass is applied some amalgam spread on leather. This is a metallic substance which has an exceeding great reflective power, being that which is employed for silverizing looking-glasses. The electric fluid therefore runs over its surface with great ease, and there is always a certain quantity of this fluid in a state of stagnation on its surface. At the place where the cylinder touches the amalgam, the air is excluded, and consequently the electric fluid hath there a tendency to rise more than at any other part of the surface where the atmosphere presses with its full force. When the cylinder begins to turn, it necessarily forces before it a small quantity of that electric matter which lay upon the surface of the amalgam. To understand this the more easily, we must consider that property which glass has of transmitting the electric fluid through it, and refusing it a passage along its surface. Thus we may conceive it to be formed of a vast number of exceedingly small tubes placed close to each other. If we suppose any substance made by art of such a texture, we would find it impossible to pour water along its surface, though it would very easily run through it. If such a substance

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Theory.

was made in the shape of a cylinder, and turned briskly round, with its surface just touching a quantity of water contained in a vessel, the consequence would be, that the water would be scattered around in all directions. The case seems to be the same with the more subtle electric fluid. The glass cylinder throws out part of the electric fluid lying on the surface of the amalgam. This quantity is perpetually renewed from the conducting side of the rubber. The quantity which is thrown out cannot be conducted over the surface of the glass, nor can it pass through it; because it is resisted by the air in the inside, and, in some measure, by the glass itself. It is also resisted by the air on the outside; but as that resistance is less than what is made by the air and glass both put together, the fluid naturally forces itself into the open air. Still, however, there neither is, nor can be, any accumulation of the matter itself. It cannot enter the air without displacing the electric matter which was there before. This will displace more of the same kind, and so on, till at last the motion is communicated to the electric matter lodged in some part of the earth. From thence it is propagated to the rubber of the electric machine, and thus a kind of circulatory motion is carried on. By the excitation of an electric substance, therefore, the fluid is not accumulated, but only set in motion. The reason of that seeming accumulation observable about the excited cylinder is, the resistance which the fluid meets with from the air. This instantly produces a divergency in the stream of electric matter, and a vibratory struggle betwixt it and the air; which again produces the appearances of fire and light, for the reasons already given.

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Proofs of
the vibrato-
ry motion
of the elec-
tric fluid.

That this kind of vibratory motion or struggle between the electric fluid and air always takes place when the latter is set in motion, seems evident from the sensation which is felt when a strongly excited electric is brought near any part of the human body. This is such as would be occasioned by a spider's web drawn lightly along the skin, or rather by a multitude of small insects crawling upon the body. It is, however, more clearly proved by an experiment made by Dr Priestley. He was desirous to know whether the electric fluid was concerned in the freezing of water or not. For this purpose, he exposed two dishes of water to the open air in the time of a severe frost. One of them he kept pretty strongly electrified; but could observe no difference in the time either when it began to freeze, which was in about three minutes, or in the thickness of the ice, when both had been frozen for some time. Happening to look out at the window through which he had put the dishes, he observed on each side of the electrified wire the same dancing vapour which is seen near the surface of the earth in a hot day, or at any time near a body strongly heated.

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Why an ex-
hausted cy-
linder can
not be ex-
cited;

If the glass cylinder which we want to excite is exhausted of air, the electric matter, instead of flying off into the air, runs directly through the glass; and, meeting with some resistance from the vacuum as it is called, a weak light is produced in the inside, but no signs of electricity are perceived on the outside of the glass. The same thing happens by giving the cylinder or tube a metallic coating. The fluid collected from the rub-

ber runs directly through the glass, and along the surface of the metallic coating, which keeps off the pressure of the air contained in the glass. If an electric lining is used, and the glass is exhausted of air, the motion of the fluid becomes visible through both, and the whole is transparent, as already observed. If the cylinder is lined with an electric substance, and the air is not exhausted, the electricity on the outside is often considerably increased; but the reason of this is not evident. Most probably it is owing to the different kind of electricity acquired by the inside lining; for electricity of any kind always produces its opposite at a small distance, the reason of which shall be afterwards given.

If the air within the cylinder is condensed, the electrical appearances on the outside are lessened in proportion. The reason of this seems to be, that though it is necessary that the fluid should not go through the substance of the glass very easily, yet it is requisite that its passage should not be totally obstructed; and therefore the electric experiments succeed best when the air within the glass is a little rarefied. We must also consider, that when an additional quantity of air is forced into the cylinder, an equal bulk of electric matter is forced out. The rest of the matter, therefore, which is contained all round the glass, presses violently into its pores; but this pressure, being directly opposite to what happens when the glass is excited, must of consequence hinder the excitation. If the glass is now made very hot, the pressure of the atmosphere is kept off, and the passage of the electric fluid through the glass and condensed air is rendered easier, and therefore the electric appearances on the outside return.

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Nor one
filled with
condensed
air.

On the same principles may we explain the excitation of a solid stick of glass, sealing-wax, or sulphur. Though these have no air within them, yet they have a very considerable quantity of electric matter, which resists an expulsion from its place: and therefore, tho' it may yield a little when the rubber is applied to the outside, yet it will instantly throw off into the atmosphere what the rubber has left on the surface; because the resistance is least towards that place, as soon as the electric has come out from under the rubber. Hence also we see the reason why no signs of electricity are observed on glass to which the rubber is immediately applied; namely, because the pressure being equally great all round, no part of the electric fluid can be thrown off into the atmosphere, in order to set the rest in motion.

The only thing necessary to be added in confirmation of this theory of excitation is, that electric substances of the same kind cannot be excited by rubbing them against one another. Thus glass cannot be excited by rubbing it against glass, &c. Mr Wilcke observed, that when two pieces of glass were rubbed upon each other in the dark, a very vivid light appeared upon them; which, however, threw out no rays, but adhered to the place where it was excited. It was attended with a strong phosphoreal smell, but no attraction or repulsion. From this experiment he inferred, that friction alone would not excite electricity; but that to produce this effect, the bodies rubbed together must be of different natures with respect to their attracting the electric fluid.

§ 7. Of Positive and Negative Electricity.

From what hath been already advanced, it will pretty plainly appear, that to increase the quantity of electric fluid in any body is a thing impossible, unless we also augment the size of the body. All the fine pores of every terrestrial fluid are exceedingly full, and unless we separate the minutest particles of the body farther from one another than they are naturally, we cannot introduce more of the electric fluid into it than there was before. This fluid, we have already seen, is not, like the air, endued with a repulsive force between its particles; and therefore it must be incompressible. If it is incompressible, all the phenomena attending it must be owing to its various motions, and the seeming accumulations of it must be owing only to its more brisk action in some places than in others. But before a complete solution of the phenomena of positive and negative electricity can be given, it is necessary to show that these are not so essentially distinct and opposite as they have been thought to be, but may be converted into each other in such cases as we cannot possibly suppose either an addition or subtraction of the electric fluid.

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Methods of
changing
positive and
negative
electricity
into one
another.

This position, however opposite to the common opinions on the subject, may be proved by the following experiments. 1. Let a coated phial be set upon an insulating stand, and let its knob be touched by the knob of another phial negatively electrified. A small spark will be observed between them, and both sides of the insulated phial will instantly be electrified negatively. Now, though we may suppose the one side of the phial which is touched by the negatively electrified one to lose part of its fire, yet this cannot be the case with the other, because there is nothing to take it away, and therefore it ought to appear in its natural state. 2. Let a phial, having a pith-ball electrometer fastened to its outside coating, be slightly charged positively, and then set upon an insulating stand. The outside is then negatively electrified, or, according to Dr Franklin's theory, has too little electric matter in it. The pith-balls, however, will touch each other, or separate but in a very small degree: but let the knob of another bottle, which hath received a strong charge of positive electricity, be brought near to the knob of the first, and the pith-balls on the outside will diverge with positive electricity. Now, it is impossible that any substance can have both too much and too little electric matter at the same instant: yet we see that negative electricity may thus instantaneously be converted into the positive kind, in circumstances where no addition of fire to the outside can be supposed. 3. Let the same phial, with the pith-balls affixed to its outside coating, be slightly charged negatively, and then insulated. The outside is now electrified positively, or, according to Dr Franklin's hypothesis, has too great a quantity of electric fluid. Nevertheless, upon bringing the knob of a phial strongly electrified negatively to that of the insulated one, the pith-balls will instantly diverge with negative electricity. 4. Let a phial receive as full a charge of positive electricity as it can contain, and then insulate it. Charge another very highly with negative electricity. Bring the knob of the negative bottle near that of the positive one, and a thread will play briskly between them. But when

the knobs touch each other, the thread after being attracted will be repelled by both. The negative electricity is somehow or other superinduced upon the positive; and, for a few moments after the bottles are separated, both will seem to be electrified negatively. But if the finger is brought near the knob of that bottle on which the negative electricity was superinduced, it will instantly be dissipated, a small spark strikes the finger, and the bottle appears positively charged as before.

From these metamorphoses of positive into negative, or negative into positive, electricity, it seems proven in the most decisive manner, that positive electricity doth not consist in an *accumulation*, nor the negative kind in a *deficiency*, of the electric fluid. We are obliged, therefore, to adopt the only probable supposition, namely, that both of them arise entirely from the different directions into which the fluid is thrown in different circumstances; and of consequence, the only method of giving an intelligible explanation of positive and negative electricity is by considering the different direction of the fluid in each.

A great variety of methods have been contrived to ascertain the direction of the electric fluid, but all of them seem uncertain except that which is drawn from the appearance of electric light. The luminous matter appearing on a point negatively electrified is very small, resembling a globule; it makes little noise, and has a kind of hissing sound. The positive electricity, on the other hand, appears in a diverging luminous stream, which darts a considerable way into the air, with a crackling noise. Now, it is certain, that in whatever case the electric fluid darts from the point into the air, in that case it must be the most resisted by it; and this is evident in the positive electricity. In this, the rays evidently *diverge* from the points. We may, indeed, suppose them to be *converging* from many points in the surrounding air towards the metallic point. But why should we imagine that a visible ray would break out from one place of the atmosphere more than another? The air, we know, resists the motion of the electric fluid, and it certainly must resist it equally. Of consequence, when this fluid is coming from the air towards a pointed conductor, it must percolate slowly and invisibly through the air on all sides equally, till it comes so near that it is able to break through the intermediate space; and as this will likewise be equal, or nearly so, all round, the negative electricity must appear like a steady luminous globule on the point, not lengthening or shortening by flashes as the positive kind does. Electricians have therefore determined with a great deal of reason, that when a point is electrified positively the matter flows out from it.

It is to be remarked, however, that in most cases, if not in all, a body cannot be electrified negatively till it has first become positively electrified; and it is in the act of discharging its positive electricity that it becomes negative. Thus, suppose a coated phial to be set upon an insulated stand, and its knob is approached by that of another bottle charged positively: a small spark is observed between them, and both sides of the insulated bottle are electrified positively; but as soon as the finger is brought near to the outside, the positive electricity is discharged by a spark, and a negative one appears. But from what hath been already advanced,

Theory.

it is evident, that positive electricity is when the fluid hath a tendency to leave any body, and the negative electricity when it hath the same tendency to enter it. Therefore, as the electric fluid is subject to mechanical laws as well as other fluids, it must follow, that these tendencies are produced and kept up by the motions excited originally in the air, and electric fluid in the air, surrounding these bodies. If this principle is kept in view, it will lead us to an easy explanation of many electrical phenomena, for which no satisfactory reason hath hitherto been given.

§ 8. Of Electric Attraction and Repulsion.

It hath now been shown, that, in bodies electrified positively, there is a flux of electric matter from their surface all round; that is, the fluid contained in their pores pushes out on every side, and communicates a similar motion to the electric fluid contained in the adjacent atmosphere. This must of necessity very soon exhaust the body of its electric matter altogether, if it was not instantaneously supplied after every emission. But this supply is immediately procured from the surrounding atmosphere. The quantity sent off is instantly returned from the air, and the vibratory motion or struggle between the air and electric fluid, which hath been often mentioned, immediately takes place. The positive electricity therefore consists in a vibratory motion in the air and electric fluid; and the force of this vibration is directed outwards from the electrified body. In bodies negatively electrified, the fluid contained in the neighbouring atmosphere is directed towards the body so electrified. But it is certain, that this motion inwards cannot be continued unless there is also a motion of the fluid outwards from the body. In this case also there is a vibratory motion, but the force of it is directed inwards, and as the source of it lies not in the body, but in the surrounding atmosphere, it manifests itself somewhat less vigorously.

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Why electric appearances continue so long.

The reason why these motions are continued for such a length of time as we see they are, is, the extreme mobility of the electric fluid. It doth not indeed appear from any experiments, that this fluid hath the least friction among its parts. A motion once induced into it must therefore continue for ever, until it is counteracted by some other motion of the same fluid. Hence, when a vibratory motion is once introduced among the particles of the electric fluid contained in any substance, that motion will be kept up by the surrounding fluid, let the body be removed to what place we please. There is no occasion indeed for supposing any thing like an electric atmosphere round the electrified body. The case is exactly the same as with a burning body. Let a candle be carried to what place we will, it will still burn; but it would be absurd to say, that the fire surrounded it like an atmosphere, as we know the fire is kept up by the air only, which is changed every moment. In like manner, the positive and negative electricities, which are two different motions of the electric fluid, are kept up by the air and electric matter contained in it; and, wherever the electrified body is carried, these fluids are equally capable of continuing them.

The phenomena of attraction and repulsion are now easily explained. Let us suppose a body positively electrified suspended by a small thread, at a distance

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from any other. The vibration above-mentioned, in which positive electricity consists, being kept up by the equable pressure on all sides, the body is neither moved to one side nor another. But when a negatively electrified body is brought near, the force of the vibration being directed outwards in the one, and inwards in the other, the pressure of the fluid in the intermediate space between them is greatly lessened; and of consequence the pressure on the other sides drives them together, and they are said to *attract* each other. If another body, electrified also positively, is brought near to the first, the force of the vibrations are directly opposed to one another, and therefore the bodies recede from each other, and are said to *repel* one another. The case is the same with two bodies negatively electrified: for there the electricity, as far as it extends round the bodies, consists of a vibratory motion of the electric fluid; and the vibrations being directed towards both the bodies, as towards two different centres, must necessarily cause them recede from each other; because, if they remained in contact, the vibratory motions would interfere with and destroy one another.

When a small body is brought within the sphere of another's electricity, the equable pressure of that vibratory or electrical sphere is somewhat lessened upon the side near which the second body is brought; and therefore it is immediately impelled towards the first by the action of the surrounding fluid, in order to keep up the equilibrium. As soon as it arrives there, the vibrations of the fluid around the first body being communicated to that within the pores of the second, it immediately acquires a sphere of electricity as well as the first, and is consequently repelled. The repulsion continues till the vibration ceases either by the action of the air, or by the body coming in contact with another much larger than itself; in which case the electricity is said to be *discharged*. If, after this discharge of electricity, the second body is still within the electric sphere of the first, it will immediately be attracted, and very soon after repelled, and so on alternately till the electricity of the former totally ceases.

§ 9. Of the Discharge of Electricity by Sparks upon blunt Conductors, and silently by pointed Ones.

THE manner in which this is accomplished will best appear from considering the nature of what is commonly called *electricity*. This cannot appear but in an electric substance; and the substance in which it doth only show itself is the air. The prime conductor of an electrical machine discovers no other properties in itself, when electrified, than it had before. The metal is equally hard, shining, and impenetrable. The electricity, or properties of attracting, repelling, &c. are all lodged in the air; and if the conductor is placed in *vacuo*, they instantly cease. It hath already been shown, that the electric matter runs over the surface of conducting substances in great quantities, like a stream of water running from one place to another. In this manner it will not pass over the surface of electrics. It enters their substance, and passes through it with a vibratory motion. This vibratory motion always shows a resistance; nor is it in any case possible to induce a vibration without first impressing a motion in one direction, and then resisting it by a contrary motion.

Theory.

Round the surface of an electrified body suspended in the air, therefore, there is always an equable pressure, by which the emission of the electric fluid is every moment checked, and by which its vibrations are occasioned. When a metallic substance is brought near the electrified body, the fluid has an opportunity of making its escape, provided it could get at the metal, because it could run along its surface. The pressure of the air is also lessened on that side which the conducting substance approaches. The whole effort of the electric matter contained in the vibratory sphere is exerted against that single place, because the resistance is least. If the body has a broad surface, however, the disproportion between these resistances is not so great as when its surface is less. Let us suppose, for instance, that the surface of the conducting substance contains an inch square, and that the whole surface of the electrified sphere contains only six square inches. When the conducting substance approaches, all the pressure is directed towards that place; and the effort made by the electric matter to escape there, is five times as great as what it is any where else. Nevertheless, though it has a vibratory motion in the substance of the air, it cannot have a progressive motion through it without violently displacing its parts; and an inch square of air makes a considerable resistance. At last, however, if this resistance is every moment made less by approaching the conducting substance nearer to the electrified body, the electric matter breaks through the thin plate of air, strikes the conductor, and runs along it. The spark is produced by the resistance it meets with from the air. But if, instead of a body with a broad surface, we present the point of a needle, whose surface is perhaps not above the ten-thousandth part of a square inch, the effort of the electric matter to discharge itself there will be 60,000 times greater than at any other place, because the whole effort of the six square inches, of which we suppose the surface of the electric sphere to consist, is exerted against that single point. The air also resists, as in the former case; but it can resist only in proportion to the extent of its surface which covers the conducting body; and this, being only the ten-thousandth part of a square inch, must be exceedingly little. As soon therefore as a needle, or any other fine pointed body, is presented to an electrified substance, the electric matter is urged thither with great velocity; and as it hath an opportunity of running along the needle, its vibrations quickly cease, and the electricity is said to be *drawn off*.—This drawing off, however, does not extend all round the electrified body, if means are used to keep up the electricity perpetually. Thus, if, on the end of the prime conductor, there are fastened a number of fine threads, hairs, &c. when the cylinder is turned, the threads on the end will diverge, and spread out like as many rays proceeding from a centre. If a point is presented on one side of the conductor, though at a considerable distance, the threads on one side will lose their divergency and hang down, but those on the other side will continue to diverge. The reason of this is, the difficulty with which the electric fluid gets through the atmosphere, even where the resistance of it is made as little as possible; and hence also we may see why more conductors than one may be necessary for the safety of large buildings. See LIGHTNING.

§ 10. *Why Positive Electricity hath a Tendency to induce the Negative Kind on any Body kept within its Sphere of Action, and why Negative Electricity produces the Positive Kind in similar Circumstances.*

Theory.

THIS is one of the electrical phenomena most difficult to be solved; and indeed seems totally insolvable, unless we give up the idea of *accumulation* and *deficiency* of the electric fluid in different bodies. On Dr Franklin's principles, no solution hath been attempted. Mr Cavallo places this among the *properties* of electricity for which he doth not pretend to account, but gives as the *causes* of other phenomena. It is indeed certain, that if a body hath already *too much* electricity or any thing else, it cannot be continually taking from those around it; and if it hath *too little*, it cannot be continually giving them. By attending to the principles above laid down, however, this phenomenon admits of an easy solution. As positive electricity consists in a vibratory motion of the electric matter in the pores of any body, and to some distance through the air, while at the same time the force is directed outwards from the body, it is plain, that if any other body is brought within this sphere, the direction of the vibration is changed; for what is *outwards* from the one is *inwards* to the other. But a vibratory motion, the force of which is directed *inwards*, is what constitutes negative electricity; and, therefore, no sooner is any body placed at some distance from one positively electrified, than it immediately becomes negatively so. The same reason may be given why negative electricity produces the positive kind on a body placed near it. In the negative kind, the force of the vibration is directed inwards. If another body is brought near, the vibration which is *inwards* to the first must be *outwards* from the second, which thus becomes positively electrified. The only difficulty here, is to account for this motion, which is only inward or outward to one side of the body brought near the electrified one, being so suddenly propagated all round. This, however, must easily be seen to arise from the extreme subtilty of the electric fluid, and its effort to keep up an equilibrium in all parts, which it will never suffer to be broken. When this fluid pushes inward to one side of a body, the fluid contained in that body would immediately yield, and allow a free passage to what came after, if its yielding was not obstructed by something on the other side. This obstruction arises from the air, which cannot admit a progressive motion of electric matter through it. No sooner, therefore, is a push made against one side than a contrary one is made against the other; and thus the body instantly becomes electrified all round.

On these principles, also, may we account for the zones of positive and negative electricity which are to be found on the surface of glass tubes*; and especially in electrified air. When the prime conductor of a machine is strongly electrified positively, it is throwing out the fluid from it in all directions. The air cannot receive this fluid without throwing out that which it also contains; and this shows, that simple electrification can neither increase nor diminish the density of the air, which is also vouched by numberless experiments. But if the air throws out its electric fluid in all directions, it must throw part of it back upon the conductor,

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Why a motion of the electric fluid on one side is suddenly propagated all round a body.

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Zones of positive and negative electricity accounted for. See n° 632.

Theory.

tor, and consequently obstruct its operations. This likewise is found to be the case; for it is impossible to make an electric machine act long with the same degree of strength, owing to the electricity communicated from it to the air. But if the conductor and air are thus reciprocally throwing the electric matter back upon one another, it is impossible but another zone of air which lies at a greater distance must be continually receiving it, or be electrified negatively. But this cannot receive, without also emitting the fluid it contains; which, therefore, will be thrown upon another zone behind it, and partly back upon the first. The original force of the fluid being now spread over a large space, will consequently be diminished; and the succeeding zone will be electrified weakly, though positively. In like manner, a succeeding zone must yield, and receive the fluid from this; which will consequently be electrified negatively, though weaker than the former: and thus zones of positive and negative electricity will gradually succeed each other in the air, till no traces of either are to be found.—In these zones, it must be remembered, that there is a centre peculiar to each, and from this centre the vibrations proceed either inward or outward. Thus, when the machine is first set in motion, a vibration is propagated from it as from a centre to some distance in the air, and the air is at first negatively electrified. But as this vibratory motion cannot be extended far in one direction, vibrations begin to be propagated in all directions from another centre at some distance. The conductor becomes then less positively electrified than before; however, by means of the machine, its electricity is still kept up, though weaker; but a zone of air beyond the first, where the resistance is much less, becomes negatively electrified. This again cannot continue long till vibrations outwards arise from another centre, and so on. It is scarce needful to add here, that the longer the electrification is continued, and the stronger it is, the broader these zones must be.

§ 11. Of the Leyden Phial.

THE phenomena of the Leyden phial are easily explained from what hath been already advanced. Glass and other electric substances are so constituted, that they can transmit the vibratory motions of the electric matter, though they cannot admit of any considerable progressive one. Conducting substances, on the other hand, admit of a progressive motion, but not so easily of a vibratory one. When the electric fluid is procured from the earth by an electric machine, if the conductor had a communication with the earth, all the matter collected by the cylinder would run along the conductor into the earth, and not a spark or other appearance of electricity would be procured in the air. But when the conductor is insulated, the matter is forced to go off into the air, and there produces the vibratory motions already mentioned. If a pane of glass which has no metallic coating touches the conductor, though it is permeable by the vibratory motion of the fluid, yet a considerable resistance is made, and the fluid cannot easily diffuse itself over its surface. Nevertheless, it will soon show signs of having received electricity, that is, of having the fluid within its pores thrown into a vibratory motion. This motion is directed outwards, from the middle of the

substance of the glass, to the surface, and a considerable way beyond it on both sides. Both sides of the glass are then positively electrified. If a conducting substance touches one of the sides of the glass, the vibrations on that side are destroyed; because the fluid which occasioned them yields to the resistance it met with, and runs along the conductor into the earth. But no sooner is this done, than the power which resisted the vibration outward from the glass having got the better in the manner just now explained, a new vibration is produced by that resisting power; and the force of this vibration is directed towards the side from whence the electricity was drawn off, which therefore becomes electrified negatively. Thus may we understand how a pane of glass, or any other electric, may receive positive electricity on the one side and negative on the other, to as high a degree as we please. But there is found to be a limit to every charge of electricity we can give; and this limit is the resistance of the air. A phial will contain double the charge in air doubly condensed that it does in the common atmosphere; and when once the vibration becomes too great to be borne, the positive side of the glass throws out pencils of light, and will receive no more electricity in that state of the atmosphere.

Thus, in every charged phial, there is a violent impulse or vibration of the fluid, *outward* from the positive, and *inward* to the negative, side. As long as these continue, the phial continues charged. As the electric fluid seems to be subject to no other natural power, but controls all its own actions only by moving in opposite directions, it is plain, that if a charged phial is carefully kept from any of those means by which it is known to be discharged, it must keep its charge for a long time; and thus, by keeping phials within glass cases, their charge will be retained for six or eight weeks, or perhaps a great deal longer. The only method of discharging a phial, is by making a communication between its coatings. The fluid pressing out of the positive side, now yields to the pressure of that from the negative side, and runs along the conductor. But no sooner does it come near the negative side of the phial, than, meeting with more of the same kind, the current of which is directed the same way, both together break through the air with a violent flash and crack, and all appearances of electricity cease.—In this, as in all other electrical experiments, it is easy to see, that the force, velocity, &c. of the fluid depends entirely on the pressure of that which surrounds us. Nature hath appointed a certain constitution or modification of the electric fluid in all terrestrial bodies, and likewise all round the earth. In our electrical experiments, we violate this constitution in some degree. When this violation is but small, the powers of nature operate gently in repairing the disorder we have introduced; but when any considerable deviation is occasioned, the natural powers restore the original constitution with extreme violence.

§ 12. The Phenomena of the Electrophorus accounted for.

THE electrophorus is a machine represented Plate CLXXVII. fig. 74. It consists of two plates, A and B, usually of a circular form; though they may be made square, or of the figure of a parallelogram, with more ease, and with equal advantage. At first the under plate was

Theory.

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In what
manner a
phial be-
comes char-
ged.

110
Why it re-
tains its
charge.

111
Reason of
its dis-
charge.

of

Theory.

112
Construc-
tion of the
electropho-
rus.

of glass, covered over with sealing-wax; but there is little occasion for being particular either with regard to the substance of the lower plate, or the electric which is put upon it. A metallic plate, however, is perhaps preferable to a wooden one, though the latter will answer the purpose very well. This plate is to be covered with some electric substance. Pure sulphur answers very near as well as the dearer electrics, sealing-wax, gum-lac, &c.; but it hath this bad quality, that, by rubbing it, some exceeding subtle steams are produced, which infect the person's clothes, and even his whole body, with a very disagreeable smell, and will change silver in his pocket to a blackish colour.—The upper plate of the electrophorus is a brass plate, or a board or piece of pasteboard covered with tin-foil or gilt paper, nearly of the same size with the electric plate, though it will not be the worse that it is somewhat larger. It is furnished with a glass handle (I), which ought to be screwed into the centre. The manner of using this machine is as follows. First, the plate B is excited by rubbing its coated side with a piece of new white flannel, or a piece of hare's skin. Even a common hard shoe-brush, having the hair a little greased, will excite sulphur extremely well. When this plate is excited as much as possible, it is set upon the table with the electric side uppermost. Secondly, the metal plate is laid upon the excited electric, as represented in the figure. Thirdly, the metal plate is touched with the finger or any other conductor, which, on touching the plate, receives a spark from it. Lastly, the metal plate A, being held by the extremity of its glass handle (I), is separated from the electric plate; and, after it is elevated above that plate, it will be found strongly electrified with an electricity contrary to that of the electric plate; in which case, it will give a very strong spark to any conductor brought near it. By setting the metal upon the electric plate, touching it with the finger, and separating it successively, a great number of sparks may be obtained apparently of the same strength, and that without exciting again the electric plate. If these sparks are repeatedly given to the knob of a coated phial, it will presently become charged.

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Mr Cavallo's ob-
servations.

“As to the continuance of the virtue of this electric plate (says Mr Cavallo), when once excited, without repeating the excitation, I think there is not the least foundation for believing it perpetual, as some gentlemen have supposed; it being nothing more than an excited electric, it must gradually lose its power by imparting continually some of its electricity to the air, or other substances contiguous to it. Indeed its electricity, although it could never be proved to be perpetual by experiments, lasts a very long time, it having been observed to be pretty strong several days, and even weeks, after excitation. The great duration of the electricity of this plate, I think, depends upon two causes: first, because it does not lose any electricity by the operation of putting the metal plate upon it, &c. and, secondly, because of its flat figure, which exposes it to a less quantity of air, in comparison with a stick of sealing-wax, or the like, which, being cylindrical, exposes its surface to a greater quantity of air, which is continually robbing the excited electrics of their virtue.

“The first experiments that I made, relative to this

machine, were with a view to discover which substance would answer best for coating the glass plate, in order to produce the greatest effect. I tried several substances either simple or mixed; and at last I observed, that the strongest in power, as well as the easiest, I could construct, were those made with the second sort of sealing-wax, spread upon a thick plate of glass. A plate that I made after this manner, and no more than six inches in diameter, when once excited, could charge a coated phial several times successively, so strongly as to pierce a hole through a card with the discharge. Sometimes the metal plate, when separated from it, was so strongly electrified, that it darted strong flashes to the table upon which the electric plate was laid, and even into the air, besides causing the sensation of the spider's web upon the face brought near it, like an electric strongly excited. The power of some of my plates is so strong, that sometimes the electric plate adheres to the metal when this is lifted up, nor will they separate even if the metal plate is touched with the finger or other conductor. It is remarkable, that sometimes they will not act well at first, but they may be rendered very good by scraping with the edge of a knife the shining or glossy surface of the wax. This seems analogous to the well-known property of glass, which is, that new cylinders or globes, made for electrical purposes, are often very bad electrics at first; but that they improve by being worked, *i. e.* by having their surface a little worn. Paper also has this property.

“If, after having excited the sealing-wax, I lay the plate with the wax upon the table, and the glass uppermost, *i. e.* contrary to the common method; then, on making the usual experiments of putting the metal plate on it, and taking the spark, &c. I observe it to be attended with the contrary electricity: that is, if I lay the metal plate upon the electric one, and, while in that situation, touch it with an insulated body, that body acquires the positive electricity; and the metallic, removed from the electric plate, appears to be negative; whereas it would become positive, if laid upon the excited wax. This experiment, I find, answers in the same manner if an electric plate is used which has the sealing-wax coating on both sides, or one which has no glass plate.

“If the brass plate, after being separated from, be presented with the edge toward the wax, lightly touching it, and thus be drawn over its surface, I find that the electricity of the metal is absorbed by the sealing-wax, and thus the electric plate loses part of its power; and if this operation is repeated five or six times, the electric plate loses its power entirely, so that a new excitation is necessary in order to revive it.

“If, instead of laying the electric plate upon the table, it is placed upon an electric stand, so as to be accurately insulated, then the metal plate set on it acquires so little electricity, that it can only be discovered with an electrometer; which shows, that the electricity of this plate will not be conspicuous on one side of it, if the opposite side is not at liberty either to part with or acquire more of the electric fluid. In consequence of this experiment, and in order to ascertain how the opposite sides of the electric plate would be affected in different circumstances, I made the following experiments.

“Upon an electric stand E, (Plate CLXXVII. fig. 74.)

I

I

Theory.

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Experi-
ments with
the electro-
phorus.

Theory.

I placed a circular tin-plate, nearly six inches in diameter, which by a slender wire H communicated with an electrometer of pith-balls G, which was also insulated upon the electric stand F. I then placed the excited electric plate D of six inches and a quarter in diameter, upon the tin-plate, with the wax uppermost; and on removing my hand from it, the electrometer G, which communicated with the tin-plate, *i. e.* with the under side of the electric plate, immediately opened with negative electricity. If, by touching the electrometer, I took that electricity off, the electrometer did not afterwards diverge. But if now, or when the electrometer diverged, I presented my hand open, or any other uninsulated conductor, at the distance of about one or two inches, over the electric plate, without touching it, then the pith-balls diverged; or, if they diverged before, came together, and immediately diverged again with positive electricity:—I removed the hand, and the balls came together;—approached the hand, and they diverged: and so on.

“If, while the pith-balls diverged with negative electricity, I laid the metal plate, holding it by the extremity K of its glass handle, upon the wax, the balls came, for a little time, towards one another, but soon opened again with the same, *i. e.* negative electricity.

“If, whilst the metallic rested upon the electric plate, I touched the former, the electrometer immediately diverged with positive electricity; which if, by touching the electrometer, I took off, the electrometer continued without divergence.—I touched the metal plate again, and the electrometer opened again; and so on for a considerable number of times, until the metal plate had acquired its full charge. On taking now the metal plate up, the electrometer G instantly diverged with strong negative electricity.

“I repeated the above-described experiments, with this only difference in the disposition of the apparatus, *i. e.* I laid the electric plate D with the excited sealing-wax upon the circular tin-plate, and the glass uppermost; and the difference in their result was, that where the electricity had been positive in the former disposition of the apparatus, it now became negative, and *vice versa*; except that, when I first laid the electric plate upon the tin, the electrometer G diverged with negative electricity, as well in this as in the other disposition of the apparatus.

“I repeated all the above experiments with an electric plate, which, besides the sealing-wax coating on one side, had a strong coat of varnish on the other side, and their result was similar to that of those made with the above-described plate.”

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Mistakes in
Mr Cavallo's ob-
servations.

This is Mr Cavallo's account of the electrophorus; but there is one part of it in which he must certainly be mistaken. He tells us, that “if instead of laying the electric plate upon the table, it is set upon an electric stand, so as to be accurately insulated, then the metal plate set on it acquires so little electricity, that it can only be discovered by an electrometer.” In what manner this gentleman came to mistake a plain fact so egregiously, is not easy to determine; but it is certain, than an electrophorus, instead of having its virtue impaired by being insulated, has it greatly increased, at least the sphere of its activity is greatly enlarged. When lying on the table, if the upper plate is put upon it without being touched with the finger,

N^o 112.

it will not show much sign of electricity. But as soon as it is put on the electric stand, both the upper and under side appear strongly negative. A thread will be attracted at the distance of eight or ten inches. If both the upper and under side are touched at the same time, a strong spark will be obtained from both, but always of the same kind of electricity, namely, the negative kind. If the upper plate is now lifted up, a strong spark of positive electricity will be obtained from it; and on putting it down again, two sparks of negative electricity will be produced.

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The singularity of this experiment is, that it produces always double the quantity of negative electricity that it doth of the positive kind; which cannot be done by any other method yet known. Another very surprising circumstance is, that when the electrophorus remains in its insulated situation, you need not always touch the upper and under side of the plates at once, in order to procure positive electricity from the upper plate: It is sufficient to touch both sides only once. On lifting up the upper plate, a spark of positive electricity is obtained as already mentioned. On putting it down again, a spark of the negative kind is obtained from the upper plate, even though you do not touch the lower one. On lifting up the upper plate, a spark of positive electricity is obtained, but weaker than it would have been had both sides been touched at once. Putting down the upper plate again without touching both, a still weaker spark first of negative and then of positive electricity will be obtained from the upper one. Thus the sparks will go on continually diminishing, to the number perhaps of two or three hundred. But at last, when the electricity of the whole machine seems to be totally lost, if both sides are touched at once, it will instantly be restored to its full strength, and the double spark of negative, with the single one of positive electricity, will be obtained without intermission as before.

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To account for all these phenomena very particularly, is perhaps impossible, without a greater degree of knowledge concerning the internal fabric of bodies than we have access to attain. In general, however, it is evident, that the phenomena of the electrophorus arise from the disposition that the electric matter hath to keep up an equilibrium within itself throughout every part of the universe. In consequence of this, no motion of the electric matter can be produced upon the one side of a body, but it must immediately be balanced by a corresponding one on the opposite side; and in proportion to the strength of the one, so will the strength of the other be. When the under plate of the electrophorus is excited, the negative electricity or vibratory action of the electric matter towards the excited side, is produced; and the moment that such an action is produced on one side, it is resisted by a similar one on the opposite side, and thus the electrophorus becomes negatively electrified on both sides. As long as the under part of the machine communicates with the earth, the vibratory motion is impeded by the progressive one towards the earth. This makes the resistance on the under side less, and therefore the vibratory motion on the upper part extends but a small way. When the plate is insulated, the electric matter has not an opportunity of escaping to the earth as before, because it is strongly resisted by the air; a vibration

General
reason of
all the phe-
nomena.

Method of
using the
Electrical
Apparatus,
&c.

bration therefore takes place on both sides, and extends to a great distance from the plate. When the upper plate is set upon the electrophorus, the same kind of electricity, viz. the negative kind, is communicated to it. When both sides are touched with the finger, or with any other conducting substance, both electricities are suddenly taken off, because the electric matter running along the conducting substance on both sides, puts an end to the vibratory motion in the air, which constitutes the very essence of what we call electricity. There is now a quiet and equal balance of the electric matter on both sides, and therefore no signs of electricity are shown. But as soon as the upper plate is taken off, this balance is destroyed. The fluid in the metal plate had not been able to penetrate the electric substance in such a manner as to put a stop to the vibrations of what was within it. As soon then as the plate is taken off, the electricity or vibratory motion towards the electric breaks out at that side. But this motion *inwards* to the electric, which constitutes negative electricity, necessarily becomes *outward* from the plate; and as no motion of the fluid can be produced on one side of a body, but what is immediately communicated to the other, the upper plate becomes electrified positively, and the under one negatively on both sides.

SECT. VII. *Of the Method of using the Electrical Apparatus already described, with some practical Rules for performing Experiments with it to the best Advantage.*

THE machines already described are calculated for exhibiting the phenomena of electricity in a very high degree; and in general the following effects may be expected from them.

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Appear-
ances on
exciting the
electric cy-
linder.

1. On whirling the cylinder in contact with the rubber, without bringing any conducting body near the former, or insulating the latter, we will perceive in the dark a stream of fire seemingly issuing from the place of contact between the rubber and cylinder, and adapting itself to the form of the cylinder so as to involve it in a blue flame mixed with bright sparks; the whole making a very perceptible whizzing and snapping noise. If the finger is brought near the cylinder in this situation, the flame and sparks will leave the cylinder and strike it; and this phenomenon will continue as long as the globe is whirled round.

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On adding
the prime
conductor.

2. On applying the prime conductor, the light will in a great measure vanish, and be perceptible only upon the points presented by it to the cylinder: but if the finger is now brought near the conductor, a very smart spark will strike it, and that at a greater or smaller distance according to the strength of the machine. This spark, when the electricity is not very strong, appears like a straight line of fire; but if the machine acts very powerfully, it will put on the appearance of zig-zag lightning, throwing out other sparks from the corners, and strike with such force as to give consider-

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able pain to those who receive it. These sparks in certain circumstances will set fire to spirits, tinder, gunpowder, &c.

Method of
using the
Electrical
Apparatus,
&c.

3. If instead of the hand or any part of the human body, we hold the knob of a coated phial near the conductor, a vast number of sparks will appear between them, first with a loud snapping noise, but gradually diminishing until at last it ceases, and pencils of blue flame intermixed with small sparks will be thrown out by the phial; and if the latter is still kept near the conductor, it will in a little time discharge itself with a violent flash and crack; after which, if the phial has not been broke by the discharge, the sparks from the conductor will begin as before, and the same phenomena be repeated as long as the cylinder is turned, or till the phial breaks.

120
Method of
drawing
sparks.

4. On applying the battery, though the accumulation of electricity be much greater than in a single phial, the signs of it are much less apparent; and sparks will always pass between the conductor and knob leading to the battery, by reason of the great evaporation from the latter into the air. But here, if one of the jars discharges itself, all the rest are likewise discharged in the same moment, and some of them generally broken.

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On apply-
ing the
battery,
&c.

5. A thread or other light body suspended near the conductor will be attracted at a considerable distance; and the force of attraction will be greater or less according to the power of the machine.

6. The electricity in all cases will be positive if the rubber be not insulated, and negative if it is so: and by Mr Nairne's contrivance of having a conductor connected with the insulated rubber, and another with the cylinder, both kinds of electricity may be had with equal ease.

All these phenomena are the more remarkable in proportion to the power of the machine. That used in Teyler's museum is the strongest of which we have yet heard; and its effects are as follow.

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Effects of
the great
machine in
Teyler's
museum.

On presenting a very sharp steel point to the prime conductor, a luminous stream of about half an inch was perceived between them. On fixing the point to the conductor so as to project three inches from it, streams of light were thrown out from the point six inches long when a ball of three inches in diameter was presented, but only two inches in length on presenting another point.

The sensation called the *spider's web* on the face of the bystanders (B) is often felt at the distance of eight feet from the prime conductor. A thread six feet long was sensibly attracted at the distance of 30 from the prime conductor, and a pointed wire appeared luminous at the distance of 28 feet; a cork-ball electrometer diverged at the distance of 40 feet.

A single spark from the conductor melted a considerable length of gold-leaf; gunpowder and other combustibles, inclosed in a paper cartridge, with a sharp point in the middle, were fired; and when another conductor communicating with the earth was placed at the distance of 21, or sometimes 24 inches

3 N

from

(B) This is a kind of sensation always produced by strong electricity, something resembling the creeping of insects or the motion of a light body, such as a spider's web, over the skin, as already mentioned. It seems to proceed from the attraction and electrification of the small hairs with which the body is covered.

Method of
using the
Electrical
Apparatus,
&c.

from the prime conductor of the machine, a stream of fire was perceived between them. This was crooked, and darting out many lateral brushes of a very large size, in the manner already mentioned. A Leyden phial, containing about one square foot of coated surface, was fully charged by about half a turn of the winch so as to discharge itself; and by repeated trials it was found, that in one minute it discharged itself 76, 78, and frequently 80 times. Lastly, it was found, that though the conductor, which received the sparks from the prime one of the machine, communicated with the earth by a wire $\frac{1}{4}$ ths of an inch in diameter, this wire would give small sparks to any conducting body brought near it, as if even this wire had not been sufficient to conduct the quantity of electricity it received from the machine very readily to the earth.

Though these effects are not to be expected from our ordinary electrical machines, yet it is certain, that by taking proper care of them they will be found to act much more powerfully than if neglected. The following directions therefore will be found useful for such as wish to make electrical experiments.

1. The first thing to be observed is, the preservation and care of the instruments. The electrical machine, the coated jars, and in short every part of the electrical apparatus, should be kept clean, and as free as possible from dust and moisture.

2. When the weather is clear, and the air dry, especially in clear and frosty weather, the electrical machine will always work well. But when the weather is very hot, the electrical machine is not so powerful; nor in damp weather, except it be brought into a warm room, and the cylinder, the stands, the jars, &c. be made thoroughly dry.

3. Before the machine be used, the cylinder should be first wiped very clean with a soft linen cloth that is dry, clean, and warm; and afterwards with a clean hot flannel, or an old silk handkerchief: this done, if the winch be turned when the prime conductor and other instruments are removed from the electrical machine, and the knuckle be held at a little distance from the surface of the cylinder, it will be soon perceived, that the electric fluid comes like a wind from the cylinder to the knuckle; and, if the motion be a little continued, sparks and crackling will soon follow. This indicates that the machine is in good order, and the electrician may proceed to perform his experiments. But if, when the winch is turned for some time, no wind is felt upon the knuckle, then the fault is, very likely, in the rubber: and to remedy that, use the following directions: By loosening the screws on the back of the rubber, remove it from its glass pillar, and keep it a little near the fire, so that its silk part may be dried; take now a dry piece of mutton suet, or a little tallow from a candle, and just pass it over the leather of the rubber; then spread a small quantity of the above described amalgam over it, and force it as much as possible into the leather. This done, replace the rubber upon the glass pillar; let the glass cylinder be wiped once more, and then the machine is fit for use.

4. Sometimes the machine will not work well because the rubber is not sufficiently supplied with electric fluid; which happens when the table, upon which the machine stands, and to which the chain of the rubber is

connected, is very dry, and consequently in a bad conducting state. Even the floor and the walls of the room are, in very dry weather, bad conductors, and they cannot supply the rubber sufficiently. In this case the best expedient is, to connect the chain of the rubber, by means of a long wire, with some moist ground, a piece of water, or with the iron work of a water-pump; by which means the rubber will be supplied with as much electric fluid as is required.

5. When a sufficient quantity of amalgam has been accumulated upon the leather of the rubber, and the machine does not work very well, then, instead of putting on more amalgam, it will be sufficient to take the rubber off, and to scrape a little that which is already upon the leather.

6. It will be often observed, that the cylinder, after being used some time, contracts some black spots, occasioned by the amalgam, or some foulness of the rubber, which grow continually larger, and greatly obstruct its electric power. These spots must be carefully taken off, and the cylinder must be frequently wiped in order to prevent its contracting them.

7. In charging electric jars in general, it must be observed, that not every machine will charge them equally high. That machine whose electric power is the strongest, will always charge the jars highest. If the coated jars, before they are used, be made a little warm, they will receive and hold the charge the better.

8. If several jars are connected together, among which there is one that is apt to discharge itself very soon, then the other jars will soon be discharged with that; although they may be capable of holding a very great charge by themselves. When electric jars are to be discharged, the electrician must be cautious, lest by some circumstance not adverted to, the shock should pass through any part of his body; for an unexpected shock, though not very strong, may occasion several disagreeable accidents. In making the discharge, care must be taken that the discharging rod be not placed on the thinnest part of the glass, for that may cause the breaking of the jar.

9. When large batteries are discharged, jars will be often found broken in it, which burst at the time of the discharge. To remedy this inconvenience, Mr Nairne says, he has found a very effectual method, which is, never to discharge the battery through a good conductor, except the circuit be at least five feet long. Mr Nairne says, that ever since he made use of this precaution, he has discharged a large battery near a hundred times without ever breaking a single jar, whereas before he was continually breaking them. But here it must be considered, that the length of the circuit weakens the force of the shock proportionably; the highest degree of which is in many experiments required.

10. It is advisable, when a jar, and especially a battery, has been discharged, not to touch its wires with the hand, before the discharging rod be applied to its sides a second and even a third time; as there generally remains a residuum of the charge, which is sometimes very considerable.

11. When any experiment is to be performed which requires but a small part of the apparatus, the remaining part of it should be placed at a distance from the machine,

Method of
using the
Electrical
Apparatus,
&c.

Fig. 29.

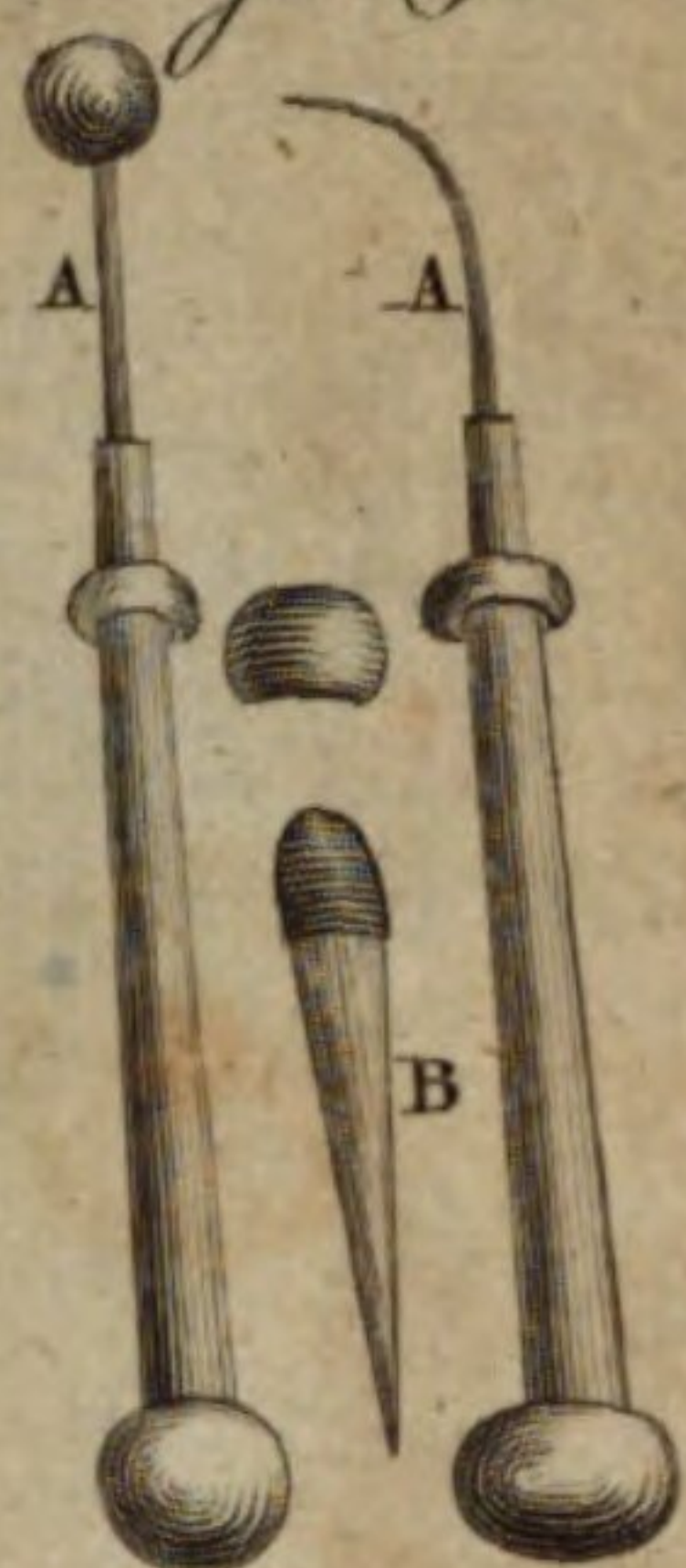


Fig. 30.



Fig. 31.



Fig. 33.

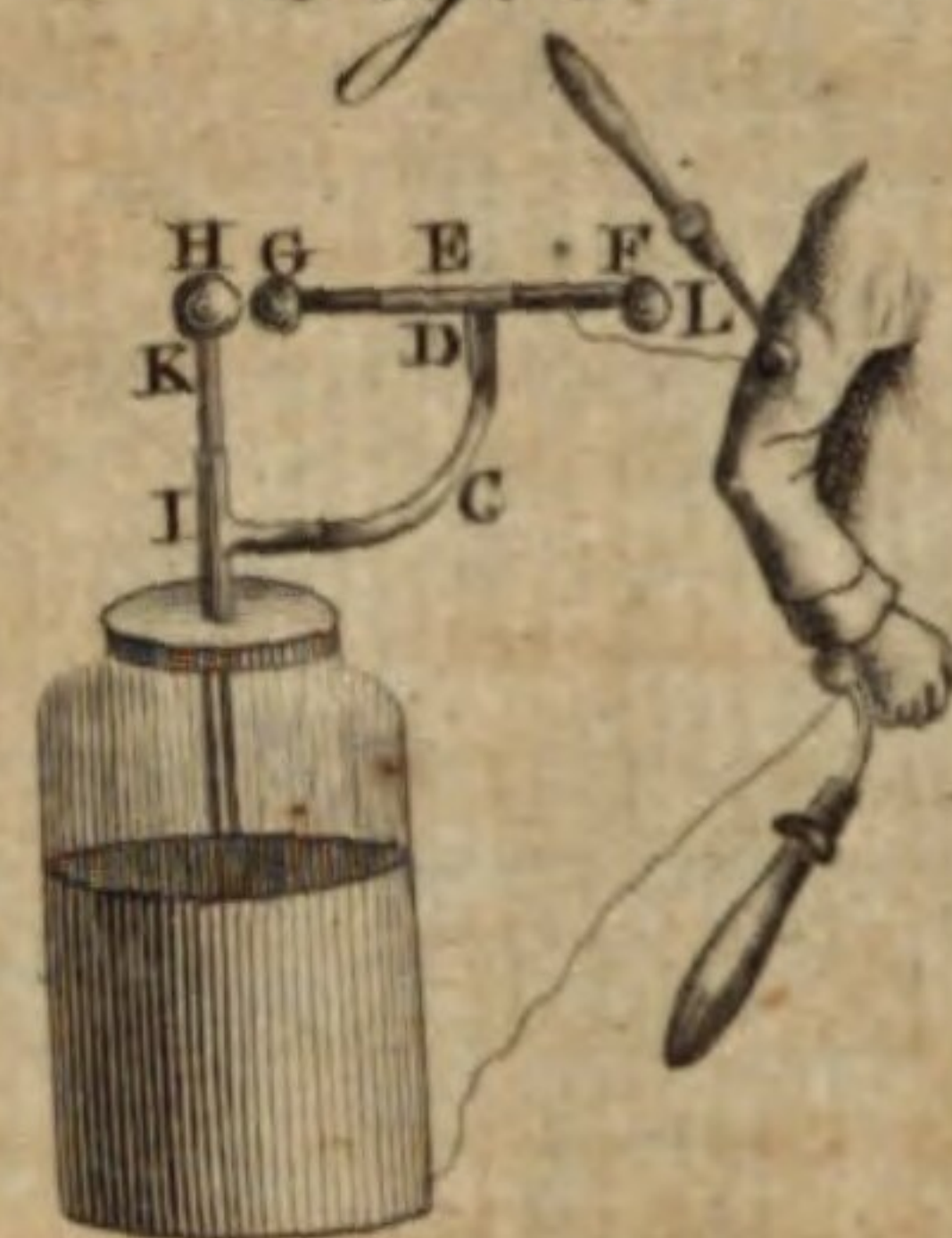


Fig. 34.



Fig. 35.

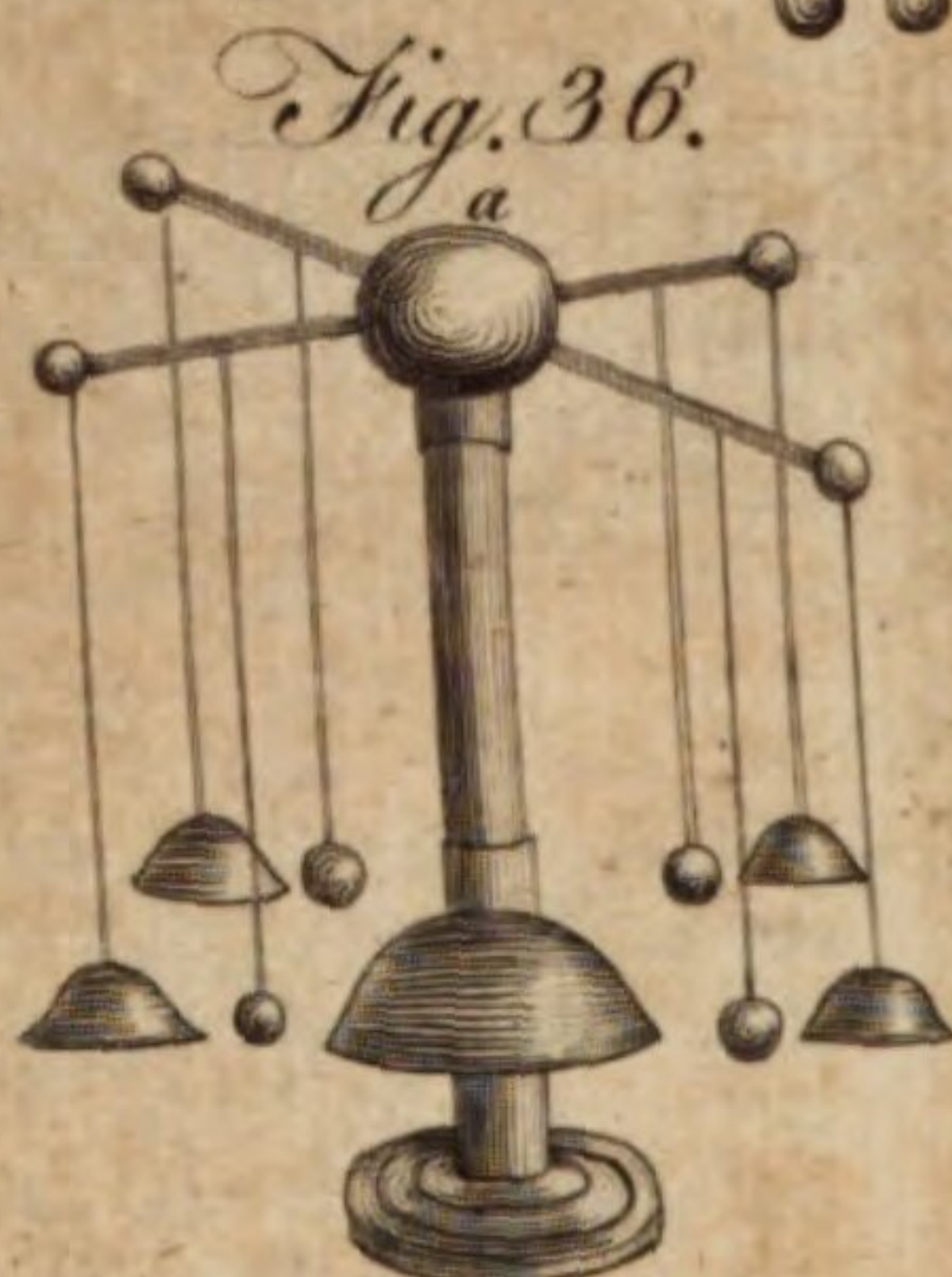
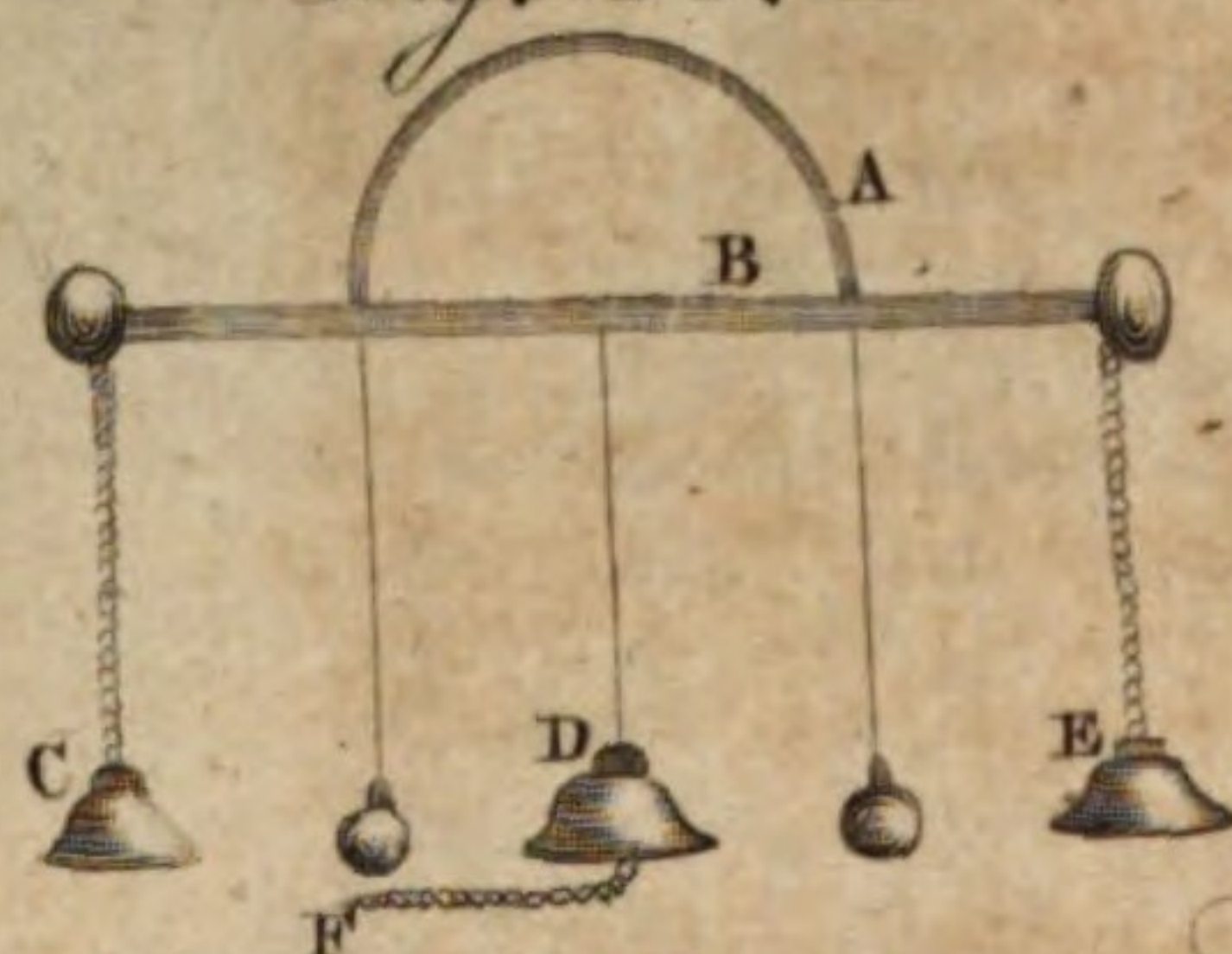


Fig. 37.

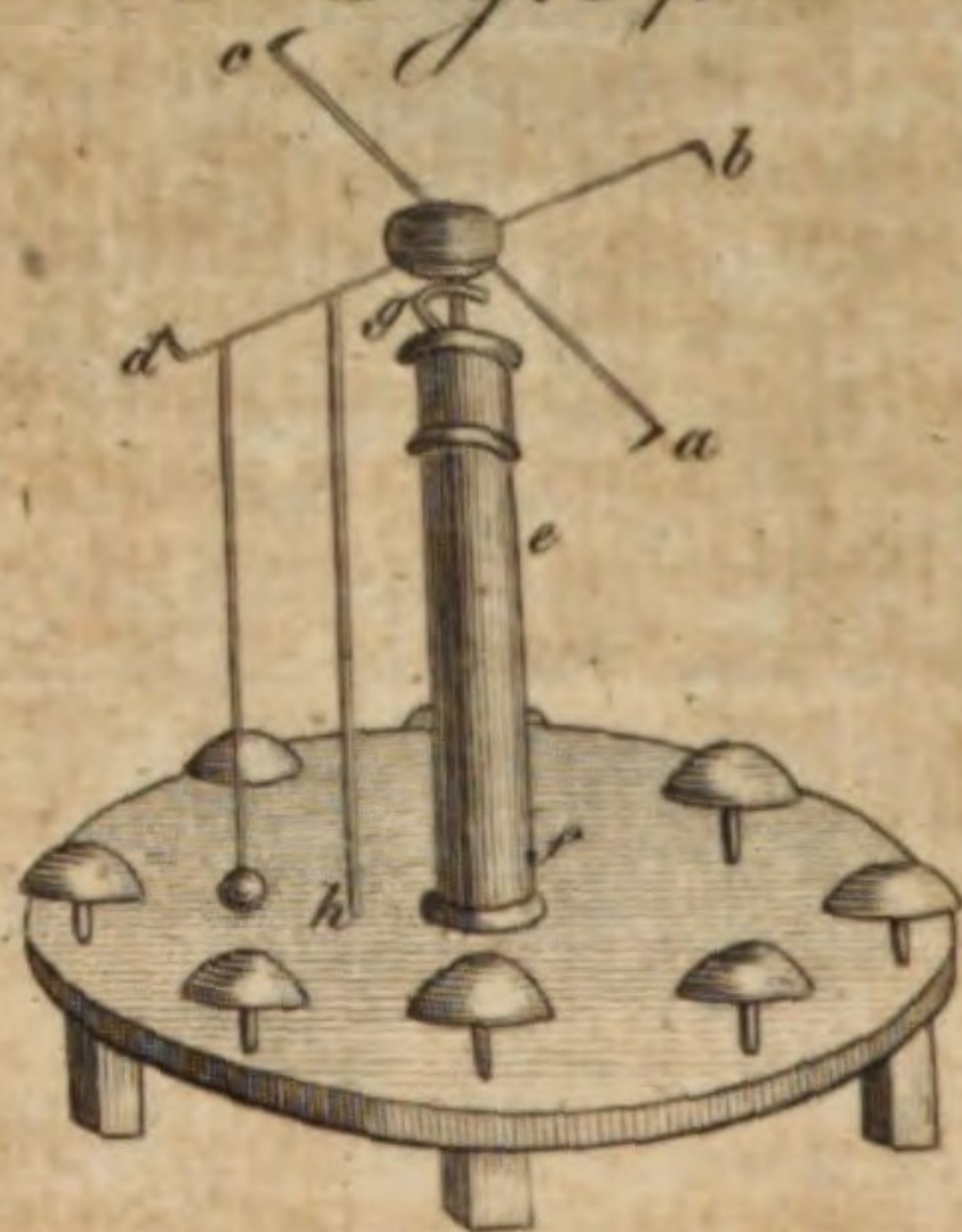


Fig. 38.



Fig. 39.



Fig. 40.



Fig. 41.

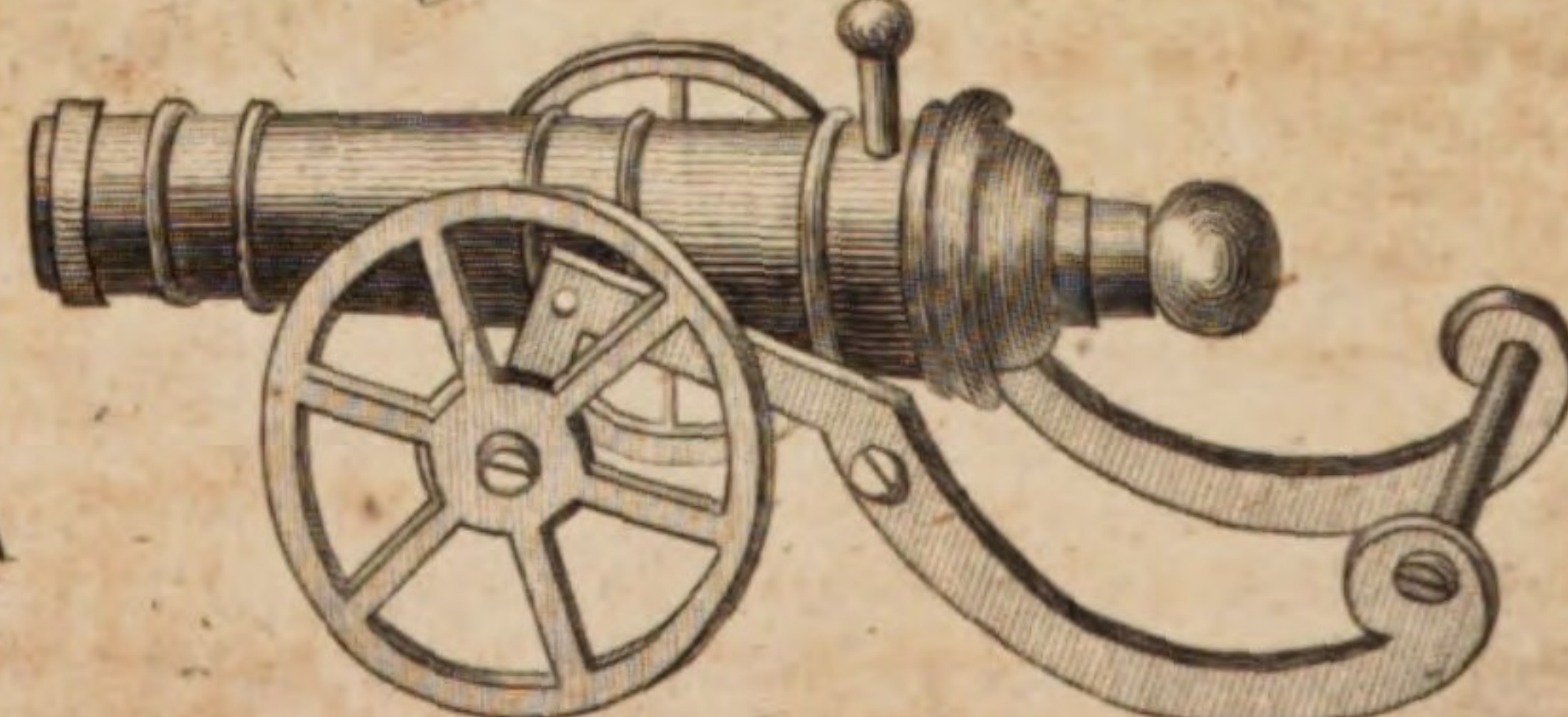


Fig. 43.



Fig. 42.

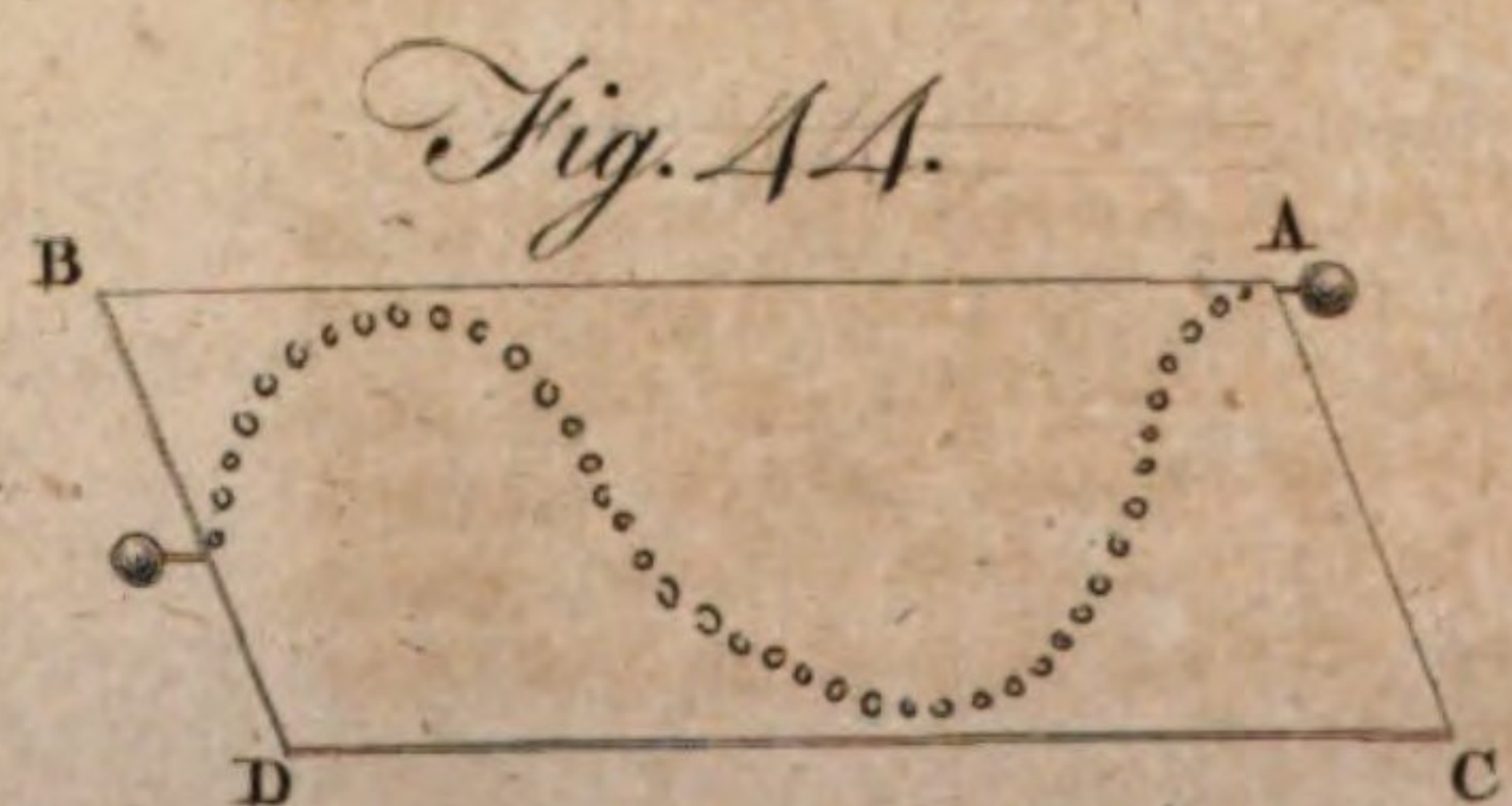


Fig. 44.

Fig. 45.



Fig. 46.



Fig. 47.



Fig. 48.



Fig. 49.



Fig. 50.



Fig. 51.



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machine, the prime conductor, and even from the table, if that is not very large. Candles, particularly, should be placed at a considerable distance from the prime conductor, for the effluvia of their flames carry off much of the electric fluid.

SECT. VIII. *Entertaining Experiments.*

I. *The Electrified Cork-ball Electrometer.*

Fix at the end of the prime conductor a knobbed rod, and hang on it two small cork-balls suspended by threads of equal length. The balls will now touch one another, the threads hanging perpendicularly, and parallel to each other. But if the cylinder of the machine be whirled by turning the winch, then the cork-balls will repel one another; and more or less according as the electricity is more or less powerful.—If the electrometer be hung to a prime conductor negatively electrified, *i. e.* connected with the insulated rubber of the machine, the cork-balls will also repel each other. If, in this state of repulsion, the prime conductor is touched with some conducting substance not insulated, the cork-balls will immediately come together. But if, instead of the conducting substance, the prime conductor is touched with an electric, as for instance a stick of sealing-wax, a piece of glass, &c. then the cork-balls will continue to repel each other; because the electric fluid cannot be conducted through that electric: hence we have an easy method of determining what bodies are conductors and what electrics. This electrical repulsion is also shown by a large downy feather, or still more agreeably by the representation of a human head with hair, as shown fig. 47. for there the electric repulsion will make the hair erect itself in a strange manner. If the feather is used, it will appear beautifully swelled by the divergency of its down.

II. *Attraction and Repulsion of light Bodies.*

CONNECT with the prime conductor, by means of the hook *H*, the two parallel brass plates *F*, *G*, as represented in fig. 38. at about three inches distance from one another; and upon the lower plate put any kind of light bodies, as bran, bits of paper, bits of leaf-gold, &c.; then work the machine, and the light bodies will soon move between the two plates, leaping alternately from one to the other with great velocity. If, instead of bran or irregular pieces of other matter, small figures of men or other things cut in paper and painted, or rather made of the pith of alder, be put upon the plate, they will generally move in an erect position, but will sometimes leap one upon another, or exhibit different postures, so as to afford a pleasing spectacle to an observing company. When bran or other substances of that kind are made use of, it will be proper to inclose both plates in a glass cylinder, by which the bran will be kept from dispersing and flying about the room.

The phenomena of electric attraction and repulsion may be represented also with a glass tube, or a charged bottle, and some of them in a manner more satisfactory than with the machine.

III. *The Flying-feather, or Shuttle-cock.*

TAKE a glass tube (whether smooth or rough is not material); and after having rubbed it, let a small light

feather be let out of your fingers at the distance of about eight or nine inches from it. This feather will be immediately attracted by the tube, and will stick very close to its surface for about two or three seconds, and sometimes longer; after which time it will be repelled; and if the tube be kept under it, the feather will continue floating in the air at a considerable distance from the tube, without coming near it again, except it first touches some conducting substance; and if you manage the tube dexterously, you may drive the feather through the air of a room at pleasure.

There is a remarkable circumstance attending this experiment; which is, that if the feather be kept at a distance from the tube by the force of electric repulsion, it always presents the same part towards the tube:—You may move the excited tube about the feather very swiftly, and yet the same side of the feather will always be presented to the tube.

This experiment may be agreeably varied in the following manner: A person may hold in his hand an excited tube of smooth glass, and another person may hold an excited rough glass tube, a stick of sealing-wax, or in short another electric negatively electrified, at about one foot and a half distance from the smooth glass tube: a feather now may be let go between these two differently excited-electrics, and it will leap alternately from one electric to the other; and the two persons will seem to drive a shuttle-cock from one to the other by the force of electricity.

IV. *The Electric Well.*

PLACE upon an electric stool a metal quart mug, or some other conducting body nearly of the same form and dimension; then tie a short cork-ball electrometer, at the end of a silk thread proceeding from the ceiling of the room, or from any other support, so that the electrometer may be suspended within the mug, and no part of it may be above the mouth: this done, electrify the mug by giving it a spark with an excited electric or otherwise; and you will see that the electrometer, whilst it remains in that insulated situation, even if it be made to touch the sides of the mug, is not attracted by it, nor does it acquire any electricity; but if, whilst it stands suspended within the mug, a conductor, standing out of the mug, be made to communicate with or only presented to it, then the electrometer is immediately attracted by the mug.

THE following experiments require to be made in the dark: for although the electric light in several circumstances may be seen in the day-light, yet its appearance in this manner is very confused; and that the electrician may form a better idea of its different appearances, it is absolutely necessary to perform such experiments in a darkened room.

V. *The Star and Pencil of Electric Light.*

WHEN the electrical machine is in good order, and the prime conductor is situated with the collector sufficiently near the glass cylinder, turn the winch, and you will see a lucid star at each of the points of the collector. This star is the constant appearance of the electric fluid that is entering a point. At the same time you will see a strong light proceeding from the

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rubber, and spreading itself over the surface of the cylinder; and if the excitation of the cylinder is very powerful, dense streams of fire will proceed from the rubber, and, darting round almost half the circumference of the cylinder, will reach the points of the collector. If the prime conductor is removed, the dense streams of fire will go quite round the cylinder; reaching from one side of the rubber to the other. If the chain of the rubber is taken off, and a pointed body, as for instance the point of a needle or a pin, is presented to the back of the rubber, at the distance of about two inches, a lucid pencil of rays will appear to proceed from the point presented, and diverge towards the rubber. If another pointed body be presented to the prime conductor, it will appear illuminated with a star; but if a pointed wire or other pointed conducting body be connected with the prime conductor, it will throw out a pencil of rays.

VI. Drawing Sparks.

LET the prime conductor be situated in its proper place, and electrify it by working the machine; then bring a metallic rod with a round knob at each end, or the knuckle of a finger, within a proper distance of the prime conductor, and a spark will be seen between that and the knuckle or knobbed wire. The longer and stronger spark is drawn from that end of the prime conductor which is farthest from the cylinder, or rather from the extremity of the knobbed rod fixed at its end; for the electric fluid seems to acquire an impetus by going through a long conductor, when electrified by a powerful machine. This spark appears like a long line of fire, reaching from the conductor to the opposed body, and often (particularly when the spark is long, and different conducting substances are near the line of its direction) it will have the appearance of being bended to sharp angles in different places, exactly resembling a flash of lightning. It often darts brushes of light sidewise in every direction.

VII. The Electric Light flashing between two Metallic Plates.

LET two persons, one standing upon an insulated stool, and communicating with the prime conductor, and another standing upon the floor, each hold in one of his hands a metal plate, in such a manner that the plates may stand back to back in a parallel situation, and about two inches asunder. Let the winch of the machine be turned, and you will see the flashes of light between the two plates so dense and frequent, that you may easily distinguish any thing in the room. By this experiment the electric light is exhibited in a very copious and beautiful manner, and it bears a striking resemblance to lightning.

VIII. To fire Inflammable Spirits.

THE power of the electric spark to set fire to inflammable spirits, may be exhibited by several different methods, but more easily thus: Hang to the prime conductor a short rod having a small knob at its end; then pour some spirits of wine, a little warmed, into a spoon of metal; hold the spoon by the handle, and place it in such a manner, that the small knob on the rod may be about one inch above the surface of the spirits. In this situation, if, by turning the winch, a spark be

made to come from the knob, it will set the spirits on fire. It will generally be found more advantageous to fix the dish containing the spirits upon the prime conductor, as represented fig. 48.

This experiment may be varied different ways, and may be rendered very agreeable to a company of spectators. A person, for instance, standing upon an electric stool, and communicating with the prime conductor, may hold the spoon with the spirits in his hand, and another person, standing upon the floor, may set the spirits on fire by bringing his finger within a small distance of it. Instead of his finger, he may fire the spirits with a piece of ice, when the experiment will seem much more surprising. If the spoon is held by the person standing upon the floor, and the insulated person brings some conducting substance over the surface of the spirits, the experiment succeeds as well.

IX. The artificial Bolognian Stone illuminated by the Electric Light.

THE most curious experiment to show the penetrability of the electric light, is made with the real, or more easily with the artificial, Bolognian stone, invented by the late Mr J. Canton. This phosphorus is a calcareous substance, generally used in the form of a powder, which has the property of absorbing light when exposed to it, and afterwards appearing lucid when brought into the dark*. Take some of this powder, and, by means of spirits of wine or ether, stick it all over the inside of a clear glass phial, and stop it with a glass stopper, or a cork and sealing-wax. If this phial be kept in a darkened room (which for this experiment must be very dark), it will give no light; but let two or three strong sparks be drawn from the prime conductor, when the phial is kept at about two inches distance from the sparks, so that it may be exposed to that light, and this phial will receive that light, and afterwards will appear illuminated for a considerable time. The powder may be stuck upon a board by means of the white of an egg, so as to represent figures of planets, letters, or any thing else at the pleasure of the operator; and the figures may be illuminated in the dark, in the same manner as the above-described phial.

A beautiful method to express geometrical figures with the above phosphorus, is to bend small glass tubes of about the tenth part of an inch diameter, in the shape and figure desired, and then fill them with the phosphorus powder. These may be illuminated in the manner described, and they are not so subject to be spoiled as the figures represented upon the board frequently are. The best method of illuminating this phosphorus, and which Mr W. Canton generally used, is to discharge a small electric jar near it.

X. The Luminous Conductor.

FIG. 24. represents a prime conductor invented by Mr Henley, which shows clearly the direction of the electric fluid passing through it, from whence it is called the luminous conductor. The middle part *EF* of this conductor is a glass tube about 18 inches long and three or four inches in diameter. To both ends of this tube the hollow brass pieces *FD*, *BE*, are cemented air-tight, one of which has a point *C*, by which

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which it receives the electric fluid, when set near the excited cylinder of the electrical machine, and the other has a knobbed wire *G*, from which a strong spark may be drawn; and from each of the pieces *FD*, *BE*, a knobbed wire proceeds within the cavity of the glass tube. The brass piece *FD*, or *BE*, is composed of two parts; *i.e.* a cap *F* cemented to the glass tube, and having a hole with a valve, by which the cavity of the glass tube is exhausted of air; and the ball *D*, which is screwed upon the cap *F*. The supporters of this instrument are two glass pillars fastened in the bottom-board *H*, like the supporters of the prime conductor. When the glass tube of this conductor is exhausted of air by means of an air-pump, and the brass ball is screwed on, as represented in the figure, then it is fit for use, and may serve for a prime conductor to an electrical machine. If the point *C* of this conductor is set near the excited cylinder of the machine, it will appear illuminated with a star; at the same time the glass tube will appear all illuminated with a weak light; but from the knobbed wire that proceeds within the glass from the piece *FD*, a lucid pencil will issue out, and the opposite knob will appear illuminated with a star, which, as well as the pencil of rays, is very clear, and discernible among the other light that occupies the greatest part of the cavity of the tube. If the point *C*, instead of being presented to the cylinder, be connected with the rubber of the machine, the appearance of light within the tube will be reversed; the knob which communicates with the piece *FD* appearing illuminated with a star, and the opposite with a pencil of rays; because in this case the direction of the electric fluid is just the contrary of what it was before; it then going from *D* to *B*, and now coming from *B* and going to *D*. If the wires within the tube *EF*, instead of being furnished with knobs, be pointed, the appearance of light is the same; but it seems not so strong in this as in the other case.

XI. *The Conducting Glass Tube.*

TAKE a glass tube of about two inches diameter, and about two feet long; fix to one of its ends a brass cap, and to the other a stop-cock or a valve; then, by means of an air-pump, exhaust it of air. If this tube be held by one end, and its other end be brought near the electrified prime conductor, it will appear to be full of light whenever a spark is taken by it from the prime conductor, and much more so if an electric jar be discharged through it. This experiment may also be made with the receiver of an air-pump: take, for instance, a tall receiver, clean and dry; and through a hole at its top insert a wire, which must be cemented air tight. The end of the wire that is within the tube must be pointed, but not very sharp; and the other end must be furnished with a knob. Put this receiver upon the plate of the air-pump, and exhaust it. If now the knob of the wire at the top of the receiver be touched with the prime conductor, every spark will pass through the receiver in a dense and large body of light, from the wire to the plate of the air-pump. When any thing is to be touched with the prime conductor that is not very portable, as the air-pump above mentioned, the communication between the former and the latter may be made by means of a rod furnished with an electric handle, or the like.

XII. *The Aurora Borealis.*

TAKE a phial nearly of the shape and size of a Florence flask; fix a stop-cock or a valve to its neck, and exhaust it of air as much as possible with a good air-pump. If this glass is rubbed in the common manner used to excite electrics, it will appear luminous within, being full of a flashing light, which plainly resembles the aurora borealis or northern light. This phial may also be made luminous, by holding it by either end, and bringing the other end to the prime conductor; in this case, all the cavity of the glass will instantly appear full of flashing light, which remains in it for a considerable time after it has been removed from the prime conductor. Instead of the above-described glass vessel, a glass tube exhausted of air and hermetically sealed may be used, and perhaps with better advantage. The most remarkable circumstance of this experiment is, that if the phial, or tube, after it has been removed from the prime conductor (and even several hours after its flashing light hath ceased to appear), be grasped with the hand, strong flashes of light will immediately appear within the glass, which often reach from one of its ends to the other.

XIII. *The Visible Electric Atmosphere.*

G I, fig. 26. represents the receiver with the plate of an air-pump. In the middle of the plate *IF*, a short rod is fixed, having at its top a metal ball *B* nicely polished, whose diameter is nearly two inches. From the top of the receiver, another rod *AD*, with a like ball *A*, proceeds, and is cemented air-tight in the neck *C*; the distance of the balls from one another being about four inches, or rather more. If, when the receiver is exhausted of air, the ball *A* be electrified positively, by touching the top *D* of the rod *AD* with the prime conductor, or an excited glass tube, a lucid atmosphere appears about it, which although it consists of a feeble light, is yet very conspicuous, and very well defined; at the same time, the ball *B* has not the least light. This atmosphere does not exist all round the ball *A*; but reaches from about the middle of it, to a small distance beyond that side of its surface which is towards the opposite ball *B*. If the rod with the ball *A* be electrified negatively, then a lucid atmosphere, like the above described, will appear upon the ball *B*, reaching from its middle to a small distance beyond that side of it that is towards the ball *A*; at the same time, the negatively electrified ball *A* remains without any light. The operator in this experiment must be careful not to electrify the ball *A* too much; for then the electric fluid will pass in a spark from one ball to the other, and the experiment will not have the desired effect. A little practice, however, will render the operation very easy and familiar.

XIV. *Of charging and discharging a Phial in general.*

TAKE a coated jar, and place it upon the table near the prime conductor, so that the knob of its wire, and that only, may be in contact with it: fix the quadrant electrometer fig. 15. upon the prime conductor, and then turn the winch of the machine. You will observe, that as the jar is charging, the index of the electrometer

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lectrometer will rise gradually as far as 90°, or thereabouts, and then rest: when this happens, you may conclude that the jar has received its full charge. If now you take a discharging rod, and holding it by the glass handle, apply first one of its knobs to the outside coating of the jar, and then bring the other knob near the knob of the wire of the jar, or near the prime conductor that communicates with it, you will hear a report, and see very vivid sparks between the discharging rod and the conducting substances, communicating with the sides of the jar. This operation discharges the jar. If, instead of using the discharging rod, you touch the outside of the jar with one hand, and bring the other hand near the wire of the jar, the same spark and report will follow; but now you will feel a shock which affects your wrists, elbows, and if strong, your breast also. If a number of persons join hands, and the first of them touches the outside of the jar, and the last touches the wire communicating with the inside, they will all feel the shock, and precisely at the same perceivable time. This shock, bearing no resemblance to any sensation otherwise felt, cannot consequently be described; and in order that a person may form a just idea of it, he must absolutely feel it. A shock may be given to any single part of the body, if that part only be brought into the circuit.

XV. *The Leyden Vacuum.*

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Fig. 22. 23. represent a small phial coated on the outside, about three inches up the sides, with tin-foil; at the top of the neck of this phial, a brass cap is cemented, having a hole with a valve, and from the cap a wire proceeds a few inches within the phial, terminating in a blunt point. When this phial is exhausted of air, a brass ball is screwed upon the brass cap, which is cemented into its neck, so as to defend the valve, and prevent any air from getting into the exhausted glass. This phial exhibits clearly the direction of the electric fluid, both in charging and discharging; for if it be held by its bottom, and its brass knob be presented to the prime conductor positively electrified, you will see that the electric fluid causeth the pencil of rays to proceed from the wire within the phial, as represented fig. 22; and if it is discharged, a star will appear in the place of the pencil, as represented in fig. 23. But if the phial is held by the brass cap, and its bottom be touched with the prime conductor, then the point of the wire on its inside will appear illuminated with a star when charging, and with a pencil when discharging. If it be presented to a prime conductor electrified negatively, all these appearances, both in charging and discharging, will be reversed.

The apparatus represented fig. 25. will be found very convenient for the various experiments upon the luminous conductor, Leyden vacuum, jars charged positively or negatively, with their different states of insulation. *A* is an insulating pillar of glass, which is screwed to the wooden foot *B*; and on this pillar all the apparatus may be screwed alternately. *CD* is an exhausted tube of glass, furnished at each end with brass caps; at the end *D* is a valve properly secured under the brass plate; a brass wire with a ball projects from the upper cap; a pointed wire proceeds from the bot-

tom plate; and this tube is called the *luminous conductor*. The flask represented at *E* is called the *Leyden vacuum*. It is furnished with a valve under the ball *E*; to come at which the more readily, the ball may be unscrewed: a wire, with a blunt end, projects to within a little of the bottom of the flask, the latter being coated with tin-foil; and a female screw is cemented to the bottom, in order to screw it on the pillar *A*. *F* is a syringe to exhaust the air occasionally, either from the luminous conductor or the Leyden vacuum. To do this, unscrew the ball of the Leyden vacuum, or the plate of the luminous conductor, and then screw the syringe in the place of either of these pieces, being careful that the bottom of the female screw *G* bears close against the leather which covers the shoulders *a b c d*; then work the syringe, and in a few minutes the glasses will be sufficiently exhausted. *H* and *I* are two Leyden bottles; each of which has a female screw fitted to the bottom, in order that they may be conveniently screwed on the pillar *A*; and the bottle *H* is furnished with a belt by which it may be screwed side-wise to the same. *K* and *L* are two small wires, to be screwed occasionally either into the ball *E*, the knobs *e* or *f*, the cap *c*, or the socket *g* on the top of the pillar: the balls may be unscrewed from these wires, which will then exhibit a blunt point. *M* is a wooden table to be screwed occasionally on the glass pillar.

XVI. *To pierce a Card and other Substances with the Electric Explosion.*

TAKE a card, a quire of paper, or the cover of a book, and keep it close to the outside coating of a charged jar; put one knob of the discharging rod upon the card, quire of paper, &c. so that between the knob and coating of the jar the thickness of that card, or quire of paper, only is interposed; lastly, by bringing the other knob of the discharging rod near the knob of the jar, make the discharge, and the electric matter will pierce a hole (or perhaps several) quite through the card or quire of paper. This hole has a bur raised on each side, except the card, &c. be pressed hard between the discharging rod and the jar; which shows that the hole is not made in the direction of the passage of the fluid, but in every direction from the centre of the resisting body. If this experiment be made with two cards instead of one, which however must be kept very little distant from one another, each of the cards, after the explosion, will be found pierced with one or more holes, and each hole will have burs on both surfaces of each card. The hole, or holes, are larger or smaller, according as the card, &c. is more damp or more dry. It is remarkable, that if the nostrils are presented to it, they will be affected with a sulphureous, or rather a phosphoreal, smell, just like that produced by an excited electric.

If, instead of paper, a very thin plate of glass, rosin, sealing-wax, or the like, be interposed between the knob of the discharging rod and the outside coating of the jar, on making the discharge, this will be broken in several pieces. Small insects may also be killed in this manner. They may be held between the outside coating of the jar and the knob of the discharging rod, like the above card; and a shock of a common phial sent through them, will instantly deprive them of

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of life, if they are pretty small: but if larger, they will be affected in such a manner, as to appear quite dead on first receiving the stroke; but will, after some time, recover: this, however, depends on the quantity of the charge sent through them.

XVII. *To show the Effect of the Shock sent over the Surface of a Card or other Substances.*

Put the extremities of two wires upon the surface of a card, or other body of an electric nature, so that they may be in one direction, and about one inch distance from one another; then, by connecting one of the wires with the outside of a charged jar, and the other wire with the knob of the jar, the shock will be made to pass over the card or other body. If the card be made very dry, the lucid track between the wires will be visible upon the card for a considerable time after the explosion. If a piece of common writing paper be used instead of the card, it will be torn by the explosion into very small bits.

If, instead of the card, the explosion is sent over the surface of a piece of glass, this will be marked with an indelible track, which generally reaches from the extremity of one of the wires to the extremity of the other. In this manner, the piece of glass is very seldom broken by the explosion. But Mr Henley has discovered a very remarkable method to increase the effect of the explosion upon the glass; which is by pressing with weights that part of the glass which lies between the two wires (*i. e.* that part over which the shock is to pass). He puts first a thick piece of ivory upon the glass, and places upon that ivory a weight at pleasure, from one quarter of an ounce to six pounds: The glass in this manner is generally broken by the explosion into innumerable fragments, and some of it is absolutely reduced into an impalpable powder. If the glass is very thick, and resists the force of the explosion, so as not to be broken by it, it will be found marked with the most lively prismatic colours, which are thought to be occasioned by very thin laminæ of the glass, in part separated from it by the shock. The weight laid upon the glass is always shook by the explosion, and sometimes it is thrown quite off from the ivory. This experiment may be most conveniently made with the universal discharger, fig. 8.

XVIII. *To swell Clay, and break small Tubes, by the Electric Explosion.*

Roll up a piece of soft tobacco-pipe clay in a small cylinder, and insert in it two wires, so that their ends without the clay may be about a fifth part of an inch from one another. If a shock be sent through this clay, by connecting one of the wires with the outside of a charged jar, and the other with the inside, it will be inflated by the shock, *i. e.* by the spark, that passes between the two wires, and, after the explosion, will appear swelled in the middle. If the shock sent through it is too strong, and the clay not very moist, it will be broken by the explosion, and its fragments scattered in every direction. To make this experiment with a little variation, take a piece of the tube of a tobacco-pipe, about one inch long, and fill its bore with moist clay; then insert in it two wires, as in the above rolled clay; and send a shock through it. This tube will not fail to burst by the force of the explosion, and its

fragments will be scattered about to a great distance. If, instead of clay, the above-mentioned tube of the tobacco-pipe, or a glass tube (which will answer as well), be filled with any other substance, either electric or non-electric, inferior to metal, on making the discharge, it will be broken in pieces with nearly the same force. This experiment is the invention of Mr Lane, F. R. S.

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XIX. *To make the Electric Spark visible in Water.*

Fill a glass tube of about half an inch diameter, and six inches long, with water; and to each extremity of the tube adapt a cork, which may confine the water; through each cork insert a blunt wire, so that the extremities of the wires within the tube may be very near one another; lastly, connect one of these wires with the coating of a small charged phial, and touch the other wire with the knob of it; by which means the shock will pass through the wires, and cause a vivid spark to appear between their extremities within the tube. In performing this experiment, care must be taken that the charge be exceedingly weak, otherwise the tube will burst. If we place in a common drinking glass, almost full of water, two knobbed wires, so bent, that their knobs may be within a little distance of one another in the water, and if one of these wires be connected with the outside coating of a pretty large jar, and the other wire be touched with the knob of it; the explosion which must pass through the water from the knob of one of the wires to that of the other, will disperse the water, and break the glass with a surprising violence. This experiment is very dangerous if not conducted with great caution.

XX. *To fire Gun-powder.*

Make a small cartridge of paper, and fill it with gun-powder, or else fill the tube of a quill with it; insert two wires, one at each extremity, so that their ends within the quill, or cartridge, may be about one fifth of an inch from one another: this done, send the charge of a phial through the wires; and the spark between their extremities, that are within the cartridge, or quill, will set fire to the gun-powder. If the gun-powder be mixed with steel-filings, it will take fire more readily, and with a very small shock.

XXI. *To strike Metals into Glass.*

Take two slips of common window-glass about three inches long, and half an inch wide; put a small slip of gold, silver, or brass leaf, between them, and tie them together, or else press them together between the boards of the press *H*, belonging to the universal discharger fig. 9. Plate CLXXIV leaving a little of the metallic leaf out between the glasses at each end; then send a shock through this metallic leaf, and the force of the explosion will drive part of the metal into so close a contact with the glass, that it cannot be wiped off, or even be affected by the common menstrua which otherwise would dissolve it. In this experiment the glasses are often shattered to pieces; but whether they are broken or not, the indelible metallic tinge will always be found in several places, and sometimes through the whole length of both glasses.

XXII.

XXII. *To stain Paper or Glass.*

LAY a chain, which forms a part of the circuit between the two sides of a charged jar, upon a sheet of white paper; and if a shock be sent through it, the paper will be found stained with a blackish tinge at the very juncture of the links. If the charge be very large, the paper, instead of being stained with spots, is brunt through. If the chain be laid upon a pane of glass instead of paper, the glass will often be found stained with spots in several places, but (as might be expected) not so deep as the paper. If this experiment be made in the dark, a spark will be seen at every juncture of the links; and if the links are small, and the shock pretty strong, the chain will appear illuminated like a line of fire.

XXIII. *The Lateral Explosion.*

If a jar be discharged with a discharging rod that has no electric handle, the hand that holds it, in making the discharge, feels some kind of shock, especially when the charge is considerable. In other words: A person, or any conducting substance, that is connected with one side of a jar, but forms no part of the circuit, will feel a kind of shock, *i. e.* some effect of the discharge. This may be rendered visible in the following manner. Connect with the outside of a charged jar a piece of chain; then discharge the jar thro' another circuit, as for instance with a discharging rod in the common way, and the chain that communicates with the outside of the jar, and which makes no part of the circuit, will appear lucid in the dark, *i. e.* sparks will appear between the links; which shows, that the electric fluid, natural to that chain, must by some means have been disturbed. This chain will also appear luminous, if it is not in contact with the outside of the jar, but only very near it; and on making the discharge, a spark will be seen between the jar and the end of the chain near it. This electrical appearance out of the circuit of a discharging jar, is that which we call the *lateral explosion*; and to make it appear in the most conspicuous manner, observe the following method, which is that of Dr Priestley.

When a jar is charged, and stands upon the table as usual, insulate a thick metallic rod, and place it so that one of its ends may be contiguous to the outside coating of the jar; and within about half an inch of its other end place a body of about six or seven feet in length, and a few inches in breadth: then put a chain upon the table, so that one of its ends may be about an inch and a half distant from the coating of the jar: at the other end of the chain apply one knob of the discharging rod, and bring the other knob to the wire of the jar, in order to make the explosion. On making the discharge in this manner, a strong spark will be seen between the insulated rod, which communicates with the coating of the jar and the body near its extremity, which spark does not alter the state of that body in respect to electricity. Whether this lateral explosion is received on flat and smooth surfaces, or upon sharp points, the spark is always equally long and vivid.

XXIV. *To discharge a Jar silently.*

WHEN a large jar is fully charged, which would give
N^o 112.

a terrible shock, put one of your hands in contact with its outside coating; with the other hold a sharp pointed needle, and keeping the point directed towards the knob of the jar, proceed gradually near it, until the point of the needle touches the knob. This operation discharges the jar entirely; and you will either receive no shock at all, or so small a one as can hardly be perceived. The point of the needle, therefore, has silently and gradually drawn all the superfluous fluid from the inside surface of the electric jar.

XXV. *Drawing the Electricity from the Prime Conductor by a Point.*

LET a person hold the knob of a brass rod at such a distance from the prime conductor, that sparks may easily fly from the latter to the former, when the machine is in motion. Then let the winch be turned; and while the sparks are following one another, present the sharp point of a needle at nearly twice the distance from the prime conductor, that the knobbed rod is held; and you will observe that no more sparks will go to the rod:—remove the needle entirely, and the sparks will be seen again;—present the needle, and the sparks disappear: which evidently shows, that the point of the needle draws off silently almost all the fluid that the cylinder throws upon the prime conductor.

If the needle be fixed upon the prime conductor with the point outward, and the knob of a discharging rod, or the knuckle of a finger, be brought very near the prime conductor, though the excitation of the cylinder may be very strong, yet you will perceive that no spark, or an exceeding small one, can be obtained from the prime conductor.

XXVI. *The Electrified Cotton.*

TAKE a small lock of cotton, extended in every direction as much as conveniently can be done; and by a linen thread about five or six inches long, or by a thread drawn out of the same cotton, tie it to the end of the prime conductor: then let the winch of the machine be turned, and the lock of cotton, on being electrified, will immediately swell, by repelling its filaments from one another, and will stretch itself towards the nearest conductor. In this situation let the winch be kept turning, and present the end of your finger, or the knob of a wire, towards the lock of cotton, which will then immediately move towards the finger, and endeavour to touch it; but take with the other hand a pointed needle, and present its point towards the cotton, a little above the end of the finger, and you will observe the cotton immediately to shrink upward, and move towards the prime conductor.—Remove the needle, and the cotton will come again towards the finger. Present the needle, and the cotton will shrink again.

XXVII. *The Electrified Bladder.*

TAKE a large bladder well blown, and cover it with gold, silver, or brass leaf, sticking it with gum-water: suspend this bladder at the end of a silk thread, at least six or seven feet long, hanging from the ceiling of the room; and electrify the bladder, by giving it a strong spark with the knob of a charged bottle: this done, take a knobbed wire, and present it to the bladder when motionless; and you will perceive, that as the knob ap-

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approaches the bladder, the bladder also moves towards the knob, and, when nearly touching it, gives it the spark which it received from the charged phial, and thus it becomes unelectrified. Give it another spark, and, instead of the knobbed wire, present the point of a needle towards it, and you will perceive that the bladder will not be attracted by, but rather recede from, the point, especially if the needle be very suddenly presented towards it.

XXVIII. *The Spider seemingly animated by Electricity.*

Plate
CLXXV.

FIG. 51. represents an electric jar, having a wire *CDE* fastened on its outside, which is bended so as to have its knob *E* as high as the knob *A*.—*B* is a spider made of cork, with a few short threads run thro' it to represent its legs. This spider is fastened at the end of a silk thread, proceeding from the ceiling of the room, or from any other support, so that the spider may hang mid-way between the two knobs *A, E*, when the jar is not charged. Let the place of the jar upon the table be marked; then charge the jar, by bringing its knob *A* in contact with the prime conductor, and replace it in its marked place. The spider will now begin to move from knob to knob, and continue this motion for a considerable time, sometimes for several hours.

The inside of the jar being charged positively, the spider is attracted by the knob *A*, which communicates to it a small quantity of electricity; the spider then becoming possessed of the same electricity with the knob *A*, is repelled by it, and runs to the knob *E*, where it discharges its electricity, and is then attracted by the knob *A*, and so on. In this manner the jar is gradually discharged; and when the discharge is nearly completed, the spider finishes its motion.

XXIX. *The Dancing Balls.*

Fix a pointed wire upon the prime conductor, with the point outward; then take a glass tumbler, grasp it with your hands, and present its inside surface to the point of the wire upon the prime conductor while the machine is in motion: the glass in this manner will soon become charged; for its inside surface acquires the electricity from the point, and the hands serve as a coating for the outside. This done, put a few pith balls upon the table, and cover them with this charged glass tumbler. The balls will immediately begin to leap up along the sides of the glass as represented fig. 39. and will continue their motion for a considerable time.

XXX. *The Electrical Jack.*

This is an invention of Dr Franklin's, and turns with considerable force, so that it may sometimes be used for the purposes of a common jack. A small upright shaft of wood passes at right angles through a thin round board of about 12 inches diameter, and turns on a sharp point of iron fixed in the lower end, while a strong wire in the upper end, passing through a small hole in a thin brass plate, keeps the shaft truly vertical. About 30 radii, of equal length, made of sash-glass cut into narrow slips, issue horizontally from the circumference of the board, the ends most distant

from the centre being about four inches apart. On the end of every one a brass thimble is fixed. If now the wire of a bottle electrified in the common way be brought near the circumference of this wheel, it will attract the nearest thimble, and so put the wheel in motion. That thimble, in passing by, receives a spark; and thereby being electrified, is repelled, and so driven forwards; while a second, being attracted, approaches the wire, receives a spark, and is driven after the first; and so on, till the wheel has gone once round; when the thimbles before electrified approaching the wire, instead of being attracted, as they were at first, are repelled, and the motion presently ceases. But if another bottle which had been charged through the coating, or otherwise negatively electrified, is placed near the same wheel, its wire will attract the thimble repelled by the first, and thereby double the force that carries the wheel round. The wheel therefore moves very swiftly, turning round 12 or 15 times in a minute, and with such force, that a large fowl spitted on the upper shaft may be roasted by means of it.

XXXI. *The Self-moving Wheel.*

This appears more surprising than the former, tho' constructed upon the same principles. It is made of a thin round plate of window-glass 17 inches in diameter, well gilt on both sides, all but two inches next the edge. Two small hemispheres of wood are then fixed with cement to the middle of the upper and under sides, centrally opposite; and in each of them a strong thick wire eight or ten inches long, which together make the axis of the wheel. It turns horizontally on a point at the lower end of its axis, which rests on a bit of brass cemented within a glass salt-celler. The upper end of its axis passes through a hole in a thin brass plate, cemented to a long and strong piece of glass; which keeps it six or eight inches distant from any non-electric, and has a small ball of wax or metal on its top to keep in the fire.

In a circle on the table which supports the wheel, are fixed 12 small pillars of glass, at about 11 inches distance, with a thimble on the top of each. On the edge of the wheel is a small leaden bullet, communicating by a wire with the gilding of the upper surface of the wheel; and about six inches from it is another bullet communicating in like manner with the under surface. When the wheel is to be charged by the upper surface, a communication must be made from the under surface to the table. As soon as it is well charged, it begins to move. The bullet nearest to a pillar moves towards the thimble on that pillar; and, passing by, electrifies it, and is then repelled from it. The succeeding bullet, which communicates with the other surface of the glass, more strongly attracts that thimble on account of its being electrified before by the other bullet; and thus the wheel increases its motion, till the resistance of the air regulates it. It will go half an hour; and make, one minute with another, 20 turns in a minute, which is 600 turns in the whole; the bullet in the upper surface giving in each turn 12 sparks to the thimbles, making in all 2500 sparks; while the same quantity of fire is thought to be received by the under bullet. The whole space moved over by these bullets in the mean time is 2500 feet. If,

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instead of two bullets, you put eight, four communicating with the upper and four with the under surface, the force and swiftness will be greatly increased, and the wheel will make about 50 turns in a minute; but then it will not continue moving for such a long time. These wheels may be applied to the ringing of chimes, and the moving of small orreries, &c.

XXXII. *The Magic Picture.*

Plate
CLXXVI.
fig. 57.

THIS is a contrivance of Mr Kinnerley; and is perhaps more calculated to give surprise than any other experiment in electricity. It is made in the following manner: Having a large mezzotinto, with a frame and glass (suppose of the king), take out the print, and cut a pannel out of it near two inches distant from the frame all round. If the cut be through the picture, it is nothing the worse. With thin paste, or gum-water, fix the board that is cut off on the inside of the glass, pressing it smooth and close; then fill up the vacancy, by gilding the glass well with leaf-gold or brass. Gild likewise the inner edge of the back of the frame all round, except the top part, and form a communication between that gilding and the gilding behind the glass; then put in the board, and that side is finished. Turn up the glass, and gild the fore-side exactly over the back gilding; and when it is dry, cover it, by pasting on the pannel of the picture that has been cut out; observing to bring the corresponding parts of the board and picture together, by which the picture will appear of a piece as at first; only part is behind the glass and part before. Lastly, hold the picture horizontally by the top, and place a little moveable gilt crown on the king's head. If now the picture is moderately electrified, and another person take hold of the frame with one hand, so that his fingers touch its inside gilding, and with the other endeavour to take off the crown, he will receive a terrible blow, and fail in the attempt. The operator, who holds the picture by the upper end, where the inside of the frame is not gilt, to prevent its falling, feels nothing of the shock; and may touch the face of the picture without danger, which he pretends to be a test of his loyalty.

XXXIII. *The Thunder-house.*

Fig. 52. is an instrument representing the side of a house, either furnished with a metallic conductor, or not; by which both the bad effects of lightning striking upon a house not properly secured, and the usefulness of metallic conductors, may be clearly represented. *A* is a board about three quarters of an inch thick, and shaped like the gable-end of a house. This board is fixed perpendicularly upon the bottom-board *B*, upon which the perpendicular glass pillar *CD* is also fixed in a hole about eight inches distant from the basis of the board *A*. A square hole *ILMK*, about a quarter of an inch deep, and nearly one inch wide, is made in the board *A*, and is filled with a square piece of wood nearly of the same dimensions. It is mentioned nearly of the same dimensions, because it must go so easily into the hole, that it may drop off by the least shaking of the instrument. A wire *LK* is fastened diagonally to this square piece of wood. Another wire *IH* of the same thickness, having a brass ball *H*, screwed on its pointed extremity, is fastened upon the board *A*; so also is the wire

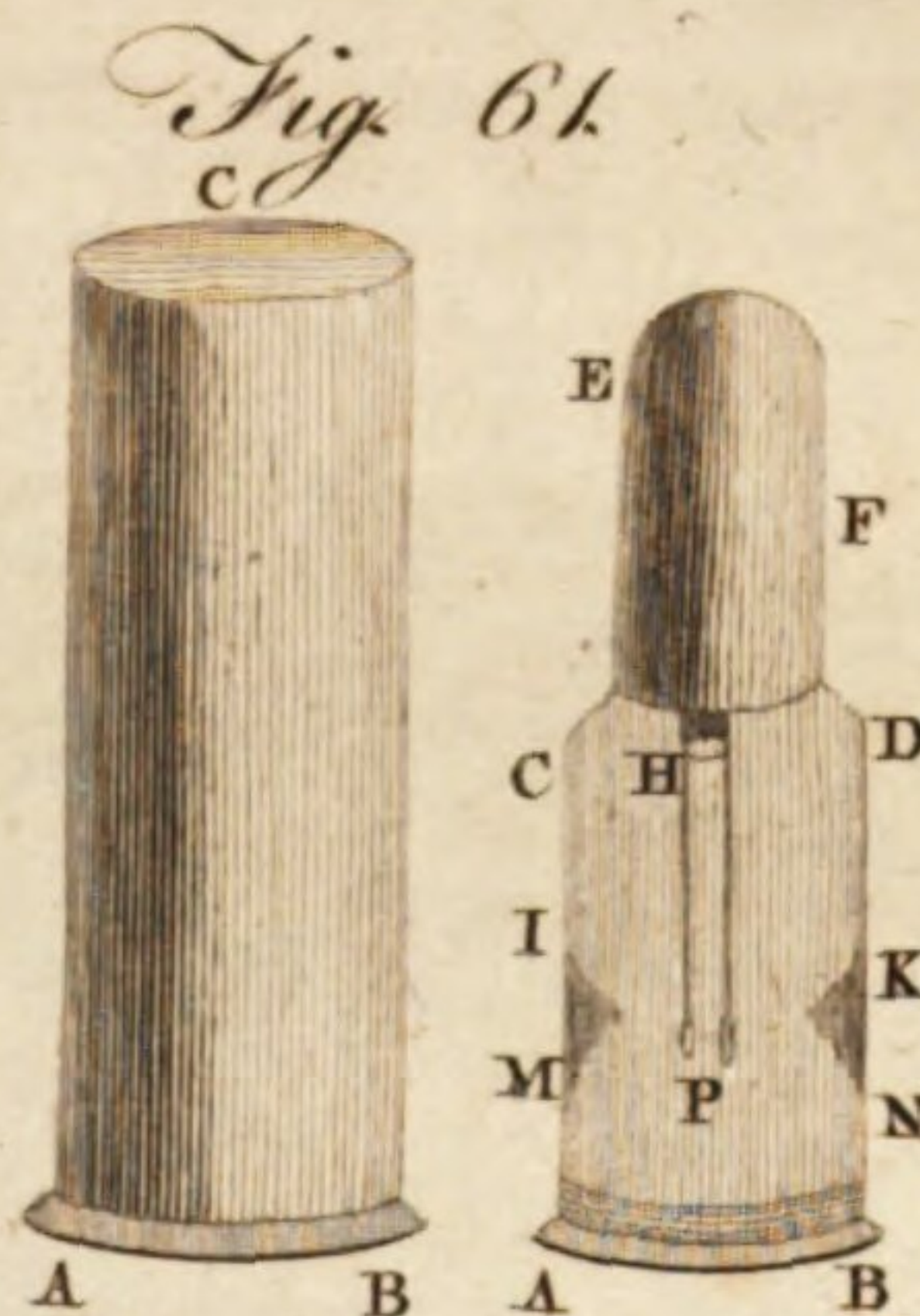
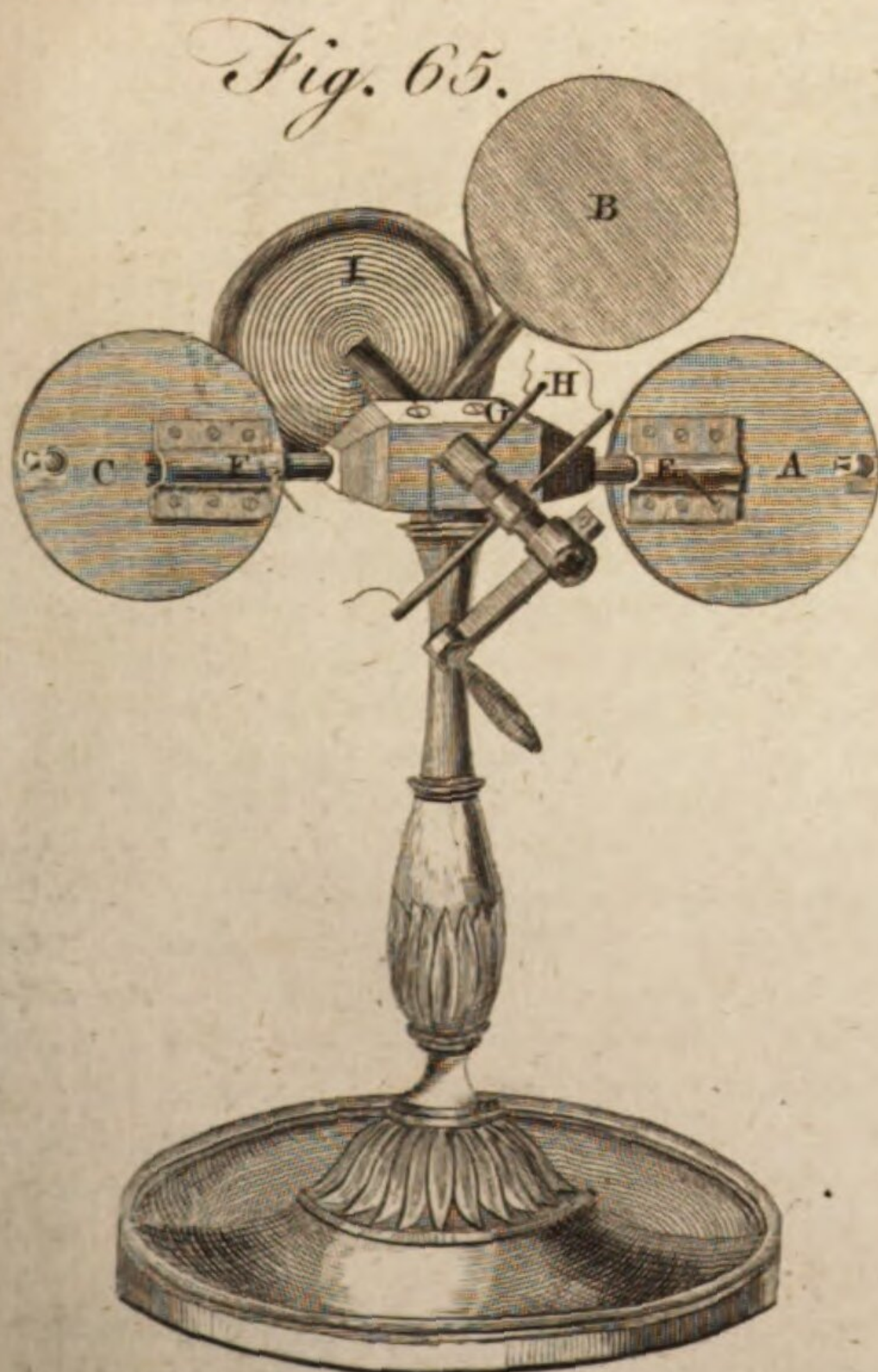
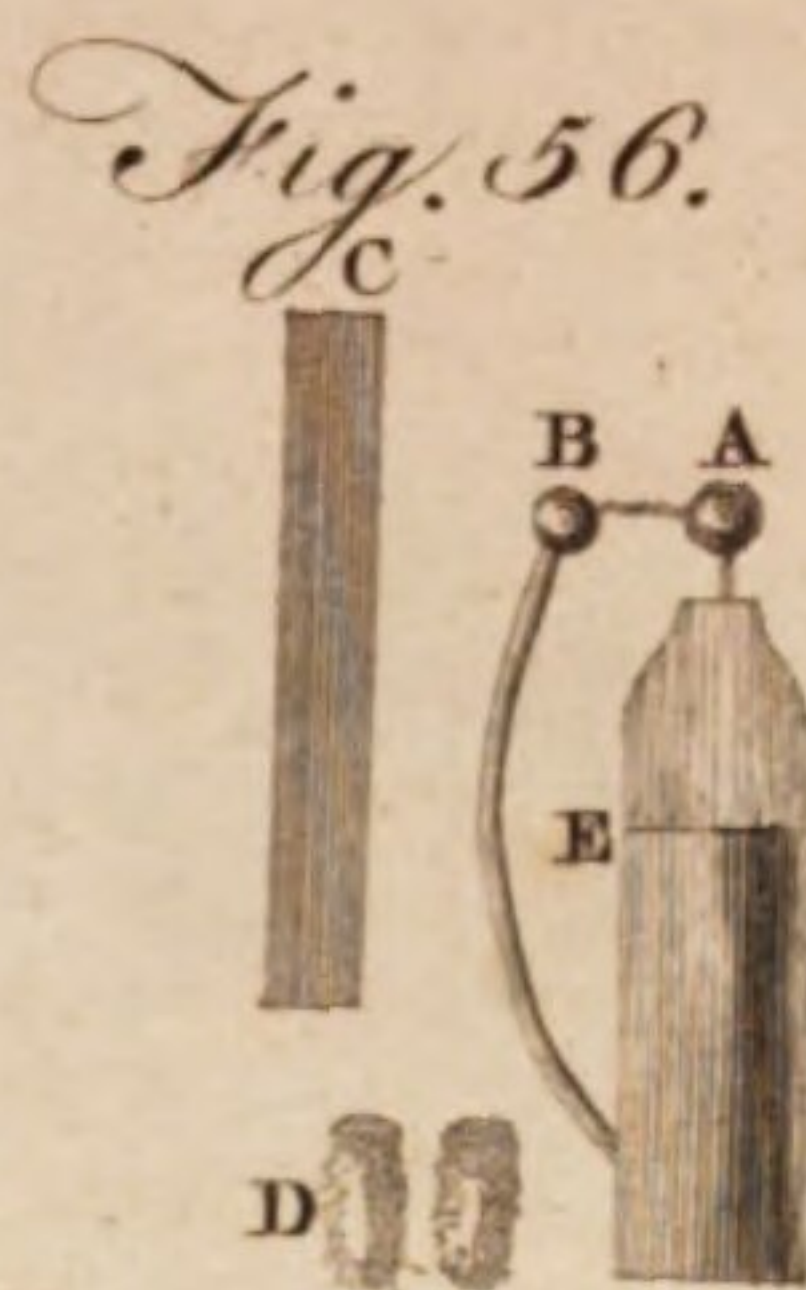
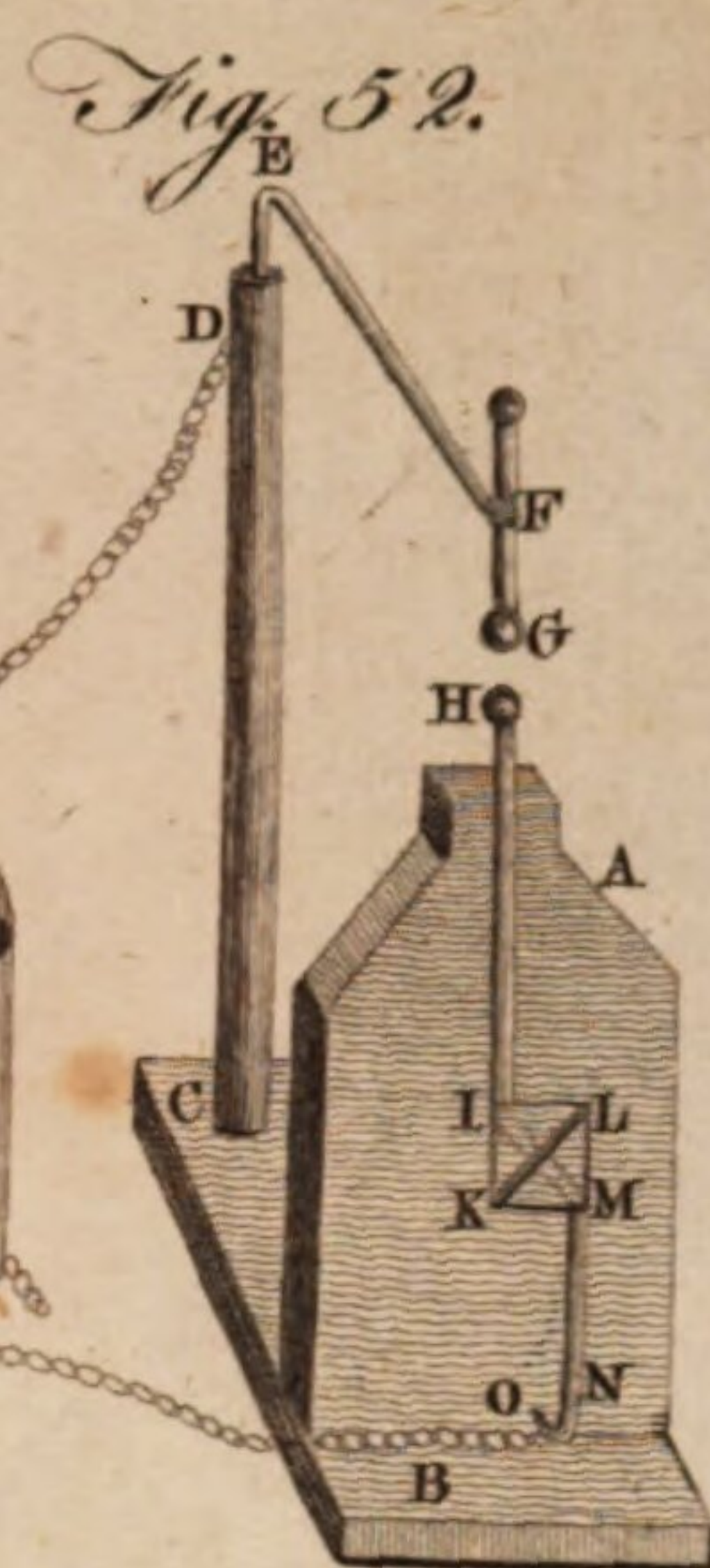
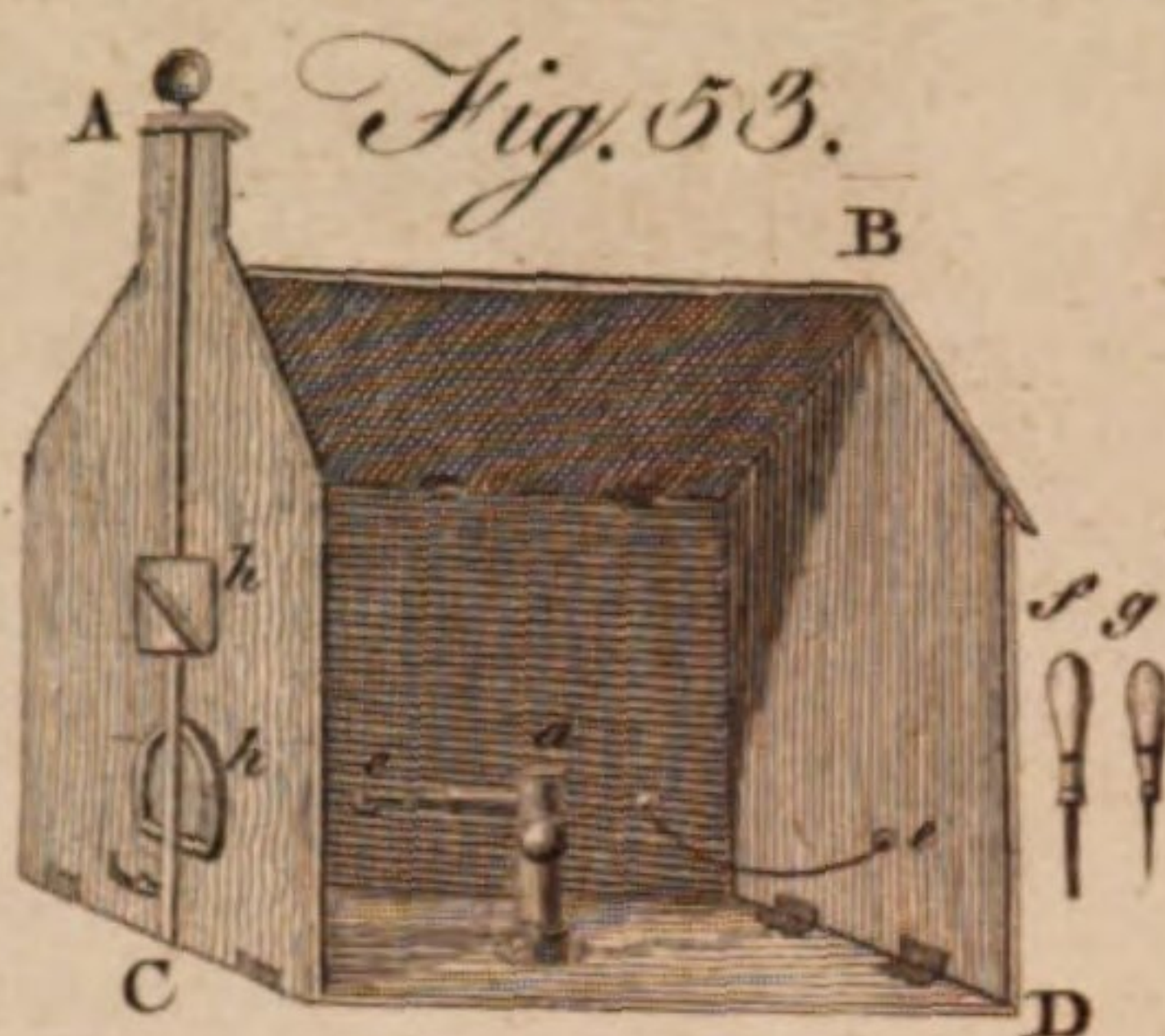
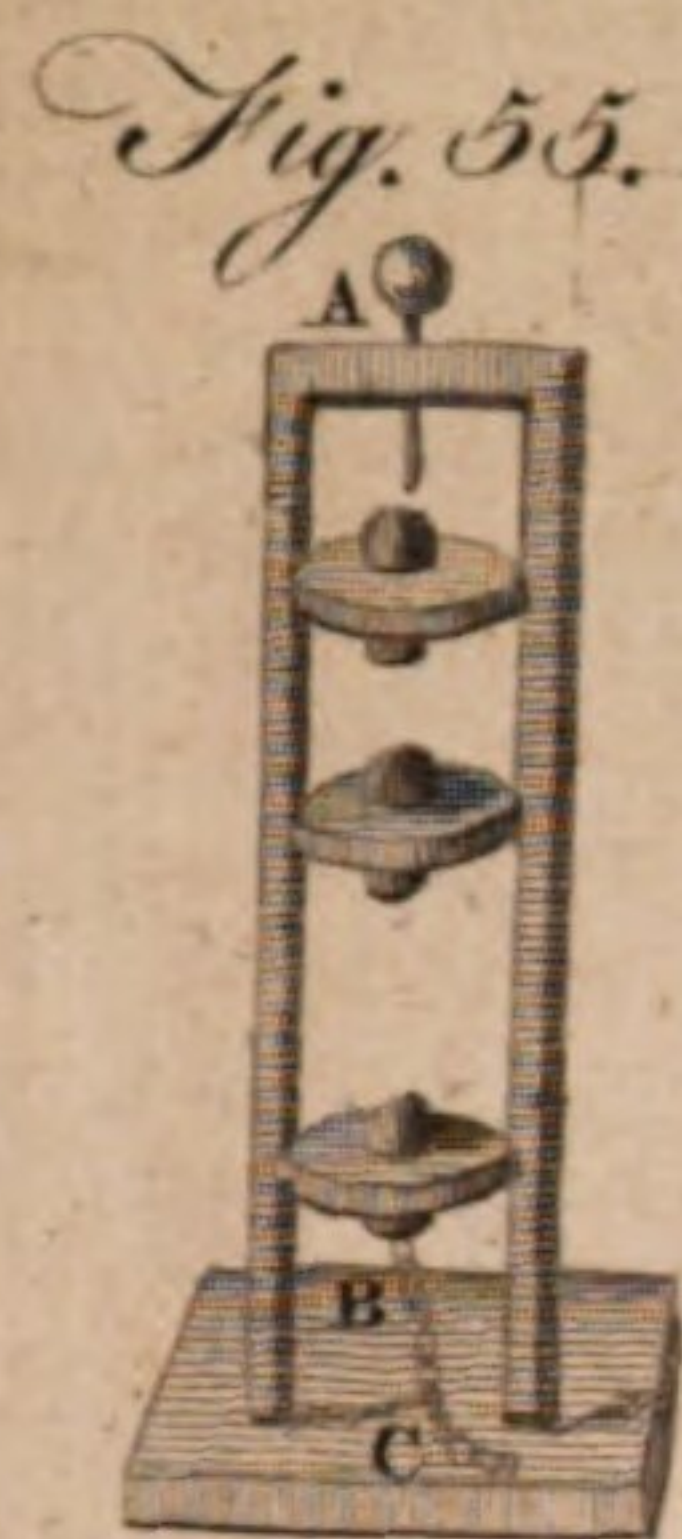
MN, which is shaped in a ring at *O*. From the upper extremity of the glass pillar *CD*, a crooked wire proceeds, having a spring socket *F*, through which a double knobbed wire slips perpendicularly, the lower knob *G* of which falls just above the knob *H*. The glass pillar *DC* must not be made very fast into the bottom board; but it must be fixed so as it may be pretty easily moved round its own axis; by which means the brass ball *G* may be brought nearer or farther from the ball *H*, without touching the part *EF*. Now when the square piece of wood *LMIK* (which may represent the shutter of a window or the like) is fixed into the hole so, that the wire *LK* stands in the dotted representation *IM*, then the metallic communication from *H* to *O* is complete, and the instrument represents a house furnished with a proper metallic conductor: but if the square piece of wood *LMIK* is fixed so, that the wire *LK* stands in the direction *LK*, as represented in the figure, then the metallic conductor *HO*, from the top of the house to its bottom, is interrupted at *IM*, in which case the house is not properly secured.

Fix the piece of wood *LMIK* so, that its wire may be as represented in the figure, in which case the metallic conductor *HO* is discontinued. Let the ball *G* be fixed at about half an inch perpendicular distance from the ball *H*; then, by turning the glass pillar *DC*, remove the former ball from the latter; by a wire or chain connect the wire *EF* with the wire *Q* of the jar *P*, and let another wire or chain, fastened to the hook *O*, touch the outside coating of the jar. Connect the wire *Q* with the prime conductor, and charge the jar; then, by turning the glass pillar *DC*, let the ball *G* come gradually near the ball *H*; and when they are arrived sufficiently near one another, you will observe that the jar explodes, and the piece of wood *LMIK* is pushed out of the hole to a considerable distance from the thunder-house. Now the ball *G*, in this experiment, represents an electrified cloud, which, when it is arrived sufficiently near the top of the house *A*, the electricity strikes it; and as this house is not secured with a proper conductor, the explosion breaks off a part, *i. e.* knocks off the piece of wood *IM*.

Repeat the experiment with only this variation, *viz.* that this piece of wood *IM* is situated so, that the wire *LK* may stand in the situation *IM*, in which case the conductor *HO* is not discontinued; and you will observe, that the explosion will have no effect upon the piece of wood *LM*, this remaining in the hole unmoved; which shows the usefulness of the metallic conductor.

Further. Unscrew the brass ball *H* from the wire *HI*, so that this may remain pointed. With this difference only in the apparatus, repeat both the above experiments; and you will find that the piece of wood *IM* is in neither case moved from its place, nor any explosion will be heard; which not only demonstrates the preference of the conductors with pointed termination to those with blunted ones; but also shows that a house furnished with sharp terminations, although not furnished with a regular conductor, is almost sufficiently guarded against the effects of lightning.

This apparatus is sometimes made in the shape of a house, as represented fig. 53. where, for the sake of



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distinctness, the side and part of the roof next the eye are not represented. The gable-end *AC* represents that of the thunder-house, and may be used in the same manner with that above described, or more readily by the following method. Let one ball of the discharging rod touch the ball of the charged jar, and the other the knob *A* of the conductor *AC* of the thunder-house; the jar will then of course explode, and the fluid will act upon the conductor just mentioned. The conducting wire at the windows *bb* must be placed in a line. The sides and gable *AC* of the house, are connected with the bottom by hinges; and the building is kept together by a ridge on the roof. To use this model, fill the small tube *a* with gunpowder, and ram the wire *c* a little way into the tube; then connect the tube *c* with the bottom of a large jar or battery. When the jar is charged, form a communication from the hook at *C*, on the outside, to the top of the jar, by the discharging rod; the discharge will fire the powder, and the explosion of the latter will throw off the roof, with the sides, back, and front, so that they will all fall down together. The figures *f* and *g* in the side of the house represent a small ram-rod for the tube *a*, and a pricker for the touch-hole at *C*. Fig. 54. represents a mahogany pyramid, by means of which the same experiment may be exhibited. It is used in a manner similar to that just now described, the piece at *a* being thrown out by the discharge; by which means the upper part falls down in three pieces.

Mr Jones of Holborn makes the front of the common thunder-houses, as well as the powder-house above described, with two pieces of wood or windows *bb*, which, by being placed in proper situations, the one to conduct and the other to resist the fluid, will illustrate by one discharge the usefulness of good conductors for securing buildings or magazines from the explosion of thunder, as well as the danger of using imperfect ones.

XXXIV. *The Electric Fly.*

THIS fly is composed of small brass wires, fig. 49. fixed into a cap of brass also, easily moveable upon an axis of the same metal, and exactly balanced, so that they may turn with the smallest force. The ends, which ought to be very sharp, are all bent one way, with regard to one another, as those belonging to *a, b*, in the figure; though the two sets of points constituting the two flies there represented, are contrary to each other; so that the whole flies must have a contrary motion. Fixing the axle with the two flies upon the prime conductor, and working the machine, both will begin to turn very swiftly, each in a direction contrary to that of the points. In this manner, with a powerful machine, a great many flies may be made to turn either in the same or in contrary directions; and by their gradual increase or decrease in size may represent a cone or other figure; for the course of each will be marked by a line of fire, and thus the whole will exhibit a beautiful appearance in the dark. The light is said to be more brilliant when the ends are slightly covered with sealing-wax, grease, or other electric matter.

In this experiment the fly will turn the same way whether the electricity be positive or negative; the reason of which will easily be conceived from the theory

already laid down, viz. that in positive electricity the fluid issues from the body electrified, and that in negative electricity it enters into it. In the former case, the recoil of the fluid, which acts equally on the air and on the point from whence it issues, must continually put the point the contrary way; and in negative electricity, when the point solicits a continual draught of electric matter from the air, the direct impulse of the former must also produce a motion in the point in the course in which the fluid itself moves. In vacuo no motion is produced; because there is no air on which the fluid may act when it issues from the point. In like manner, when air is inclosed in a glass vessel, the motion of the electric fly soon stops; because the fluid cannot easily get through the air and the glass, and therefore its motions are impeded so that it cannot press with force sufficient to produce motion. On applying a conductor to the outside of the glass, the fly renews its motion; because an opportunity is now given to the fluid to escape, by running through the glass. But this, for the reasons already given, must soon cease, because a contrary action of the fluid instantly begins to take place; and in a short time becomes equal to that which urges it forward from the machine. The motion of the fly, therefore, stops for the same reason that a Leyden phial becomes at last saturated and cannot receive a greater charge; and which has been already so fully discussed, that it would be superfluous to say more on the subject. Fig. 50. shows another fly which turns perpendicularly, and which will be readily understood from what has been already said.

XXXV. *The Electrified Bells.*

Fig. 35. represents an instrument having three bells, which are made to ring by electric attraction and repulsion. *B* is a brass rod, furnished with a ring *A* of the same metal, by which it is suspended from another rod fixed in the prime conductor. The outer bells *C* and *E* are suspended by brass chains; but the middle bell *D* and the two small brass clappers between *CD* and *DE* are suspended by silk threads. From the concave under part of the bell *D* a chain proceeds, which falls upon the table, and has a silk thread *E* at its extremity. When this apparatus is hung to the conductor by the ring *A*, and the cylinder of the machine gently turned, the clappers will fly from bell to bell with a rapid motion, and the bells will ring as long as they are kept electrified. The two bells *C* and *E* being suspended by brass chains, are first electrified: hence they attract the clappers, communicate to them a little electricity, and repel them to the unelectrified bell *D*; upon which the clappers deposit their electricity, and move again to the bells *CE*, from which they acquire more, and so on. If, by holding the silk thread *F*, the chain of the middle bell be raised from the table, the bells after ringing a little while will stop; because the bell *D* will have no opportunity of conveying the electricity it receives from the clappers to the ground, being insulated by the silk thread. In the dark, sparks will be seen between the clappers and bells.

Fig. 36. represents a set of bells more elegantly mounted, and which produce a better sound. In these the knob *a* must communicate with the conductor when the apparatus is made use of. Fig. 37. represents

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a set of eight bells otherwise constructed. The clapper *b* is here suspended by a silken thread from the fly *a b c d*: the axis of the fly rests in a small hole on the top of a glass pillar; and its upper part moves freely in, and is confined by a hole in the brass arm *g*. To make use of these bells they must be applied to the cylinder of the machine, or at least brought very near it when the conductor is removed; so that the fly *a b c d* may be about the height of the centre of the cylinder. The latter being then put in motion, the electricity from it proceeding to the fly, will cause it to turn round in the manner described in the foregoing experiment, and the clapper attracted by each of the bells alternately in its rotation; which, if they are properly turned, will produce a pleasing and harmonious sound.

XXXVI. *To fire a Pistol or Cannon by Inflammable Air.*

Fig. 40. represents a brass pistol for inflammable air. It consists principally of a chamber, to the mouth *D* of which a cork is fitted: a glass tube *F* is cemented into the top of the chamber, through which a brass wire passes, and is bent within side so as to approach within an eighth part of an inch of the side. On the outside end of this wire is screwed a brass ball *A*, which serves to receive a spark from the conductor of the machine, and conduct it in that form to the inside of the pistol. The inflammable air with which the pistol is to be charged may be made in a common stone-ware or glass bottle, by mixing a handful of iron-filings with about two wine-glassfuls of water and near one of oil of vitriol. The air, when thus made, should be kept in a bottle corked up. To make use of the pistol, take out the cork from the bottle, and instantly apply the mouth of the pistol to the mouth of the bottle; and in about ten seconds it will be sufficiently charged: then remove it, and cork both the pistol and bottle with the utmost expedition: then bring the ball *A* near the prime conductor or the knob of a charged jar; and the spark that passes through the ball, and between the end of the wire within side and the side of the chamber, will fire the inflammable air with a loud report, and drive the cork to a considerable distance. Instruments to fire inflammable air are often made in the form of a cannon with its carriage, as in fig. 41.

XXXVII. *The Spiral Tube.*

Fig. 42. represents an instrument composed of two glass tubes *C D*, one within another, and closed with two knobbed brass caps *A* and *B*. The innermost of these has a spiral row of small round pieces of tin-foil stuck upon its outside surface, and lying at about one-thirtieth of an inch from each other. If this instrument be held by one of its extremities, and its other extremity be presented to the prime conductor, every spark that it receives from the prime conductor will cause small sparks to appear between all the round pieces of tin-foil stuck upon the innermost tube; which in the dark affords a pleasing spectacle, the instrument appearing encompassed by a spiral line of fire.

Fig. 43. represents several spiral tubes placed round a board, in the middle of which is screwed a glass pillar, and on the top of this pillar is cemented a brass cap with a fine steel point. In this a brass wire turns, having a brass ball at each end, nicely balanced on the wire. To make use of this apparatus, place the middle

of the turning wire under a ball proceeding from the Entertain-
conductor, so that it may receive a succession of sparks ing Experi-
from the ball; then push the wire gently round; and ments.

the balls in their relative motions will give a spark to each tube, and thereby illuminate them down to the board, which from its brilliancy and rapid motion affords a most beautiful and pleasing sight. The small pieces of tin-foil are sometimes stuck on a flat piece of glass *ABCD*, fig. 44. so as to represent various fanciful figures. Upon the same principle is the luminous word *light* produced. It is formed by the small separations of the tin-foil pasted on a piece of glass fixed in a frame of baked wood, as represented fig. 45. To use this, the frame must be held in the hand, and the ball *G* presented to the conductor. The spark then will be exhibited in the intervals composing the word; from whence it passes to the hook at *b*, and thence to the ground by a chain. The brilliancy of this is equal to that of the spirals.

XXXVIII. *To fire a Piece of Iron-wire in Dephlogisticated Air.*

THE apparatus for this is represented fig. 28. n° 2. Plate
where the wire is twisted into a spiral figure. When CLXXIV.
this is done, it may easily be inserted in the brass knob *D*. The jar comes out of the bottom *C*, and is filled with the dephlogisticated air, as directed under the article AEROLOGY. The electricity of a common jar being then instantly sent down through the ball and wire at *A*, an explosion takes place betwixt the end of the small wire and the lower ball *B*, which sets the end of the former on fire. It burns with remarkable brightness; and by reason of the spiral shape into which it is twisted, shows the appearance of a small sun moving from the top to the bottom of the jar, and slowly moving round as the wire, which is of a spiral shape, gradually burns away.

XXXIX. *The Electrified Capillary Syphon.*

LET a small bucket of metal filled with water be Plate
suspended from the prime conductor, and put in a CLXXV.
glass syphon so narrow in the extremity that the water may just drop from it. If in this disposition of the apparatus the winch of the machine be turned, the water, which when not electrified run out only by drops, will now run in a full stream, or even be subdivided into smaller streams; and if the experiment be made in the dark, the appearance will be very beautiful. The same phenomenon will be exhibited by a small bucket with a jet, as represented fig. 46. or the experiment may be agreeably varied, by hanging one bucket from a positive conductor and another from a negative one; so that the ends of the tubes or jets may be about three or four inches from each other. The stream issuing from the one will be attracted by that issuing from the other, and both will unite into one; but though both are luminous in the dark before meeting, the united stream will not be so unless the one electricity has been stronger than the other.

XL. *To illuminate Eggs.*

FIG. 55. represents a mahogany stand so constructed. Plate
as to hold three eggs at a greater or smaller distance, CLXXVI.
according to the position of the sliding pieces. A chain *C* is placed at the bottom in such a manner as

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to touch the bottom of the egg at *B* with one end, and with its other the outside coating of a charged jar. The sliding wire *A* at top is made to touch the upper egg; and the distance of the eggs asunder should not exceed the quarter or eighth part of an inch. The electricity being by means of the discharging rod sent down the ball and wire at *A*, will in a darkened room render the eggs very luminous and transparent, as has already been mentioned.

XLII. To render Ivory or Boxwood luminous.

PLACE an ivory ball on the prime conductor of the machine, and take a strong spark, or send the charge of a Leyden bottle through its centre, the ball will appear perfectly luminous; but if the charge be not taken through the centre, it will pass over the surface of the ball and corrode it. A spark taken through a ball of boxwood not only illuminates the whole, but makes it appear of a beautiful crimson or rather fine scarlet colour.

XLIII. To illuminate Water.

CONNECT one end of a chain with the outside of a charged jar, and let the other lie upon the table. Place the end of another piece of chain at about one quarter of an inch from the former; then set a decanter of water on these separated ends; and on making a discharge, the water will appear perfectly and beautifully luminous.

XLIV. To make a beautiful Appearance in vacuo.

Plate
CLXXVI.

FIG. 58. represents a glass barometer tube, having on the end *B* a steel cap fastened to the glass with cement. From this proceed a wire and ball *c d*. Fill this tube with quicksilver; and then by sending up a large bubble of air, and repeatedly inverting the tube, free the quicksilver and iron ball from air: then put a small drop of ether on the quicksilver, and put the finger on the end of the glass tube; and then invert the end *f* in a basin of quicksilver, taking care not to remove the finger from the end of the tube till the latter be immersed under the surface of the quicksilver. When the finger is removed, the mercury will descend, and the ether expand itself; present the metallic top of the tube to a large charged conductor, and a beautiful green spark will pass through the vapour of the ether from the ball *d* to the quicksilver. By admitting a small quantity of air into the tube, an appearance something like a falling star is produced.

XLV. To render Gold-leaf or Dutch-metal luminous.

THIS is done by discharging the contents of a small Leyden jar over it. A strip of gold leaf one-eighth of an inch in breadth and a yard long, will frequently be illuminated throughout its whole extent, by the explosion of a jar containing two gallons. This experiment may be beautifully diversified, by laying the gold or silver leaf on a piece of glass, and then placing the glass in water; for the whole gold-leaf will appear most brilliantly luminous in the water, by exposing it thus circumstanced to the explosion of a battery.

XLVI. To perforate a Glass Tube.

FIG. 59. represents a small glass tube stopped at one

end with a piece of cork; *k* is a wire with a ball, at one end of which is a brass ball; the other passes through a cork fitted to the upper part of the tube. This end of the wire is bent at right angles, in such a manner as to approach the side of the tube. To perform the experiment, take out the upper cork and wire, and then pour some salad oil into the tube; replace the cork, and push down the wire, so that the end of it may be near or rather below the surface of the oil; present the ball to the electrified conductor, holding the finger or any other conducting substance opposite to the bent end of the wire; and when the spark passes from the conductor to the brass ball, the same will pass along the wire, perforating the tube in order to get at the finger, and produce a curious agitation of the oil.

XLVII. The Inflammable Air-lamp.

FIG. 60. represents this machine, which is an invention of M. Volta. *A* is a glass globe to contain the inflammable air; *B*, a glass basin or reservoir to hold water; *D*, a cock to form occasionally a communication between the reservoir of water and that of air. The water passes into the latter through the metal pipe *gg*, which is fixed to the upper part of the reservoir *A*; as *s* is a small cock to cut off or open a communication with the air in the ball and the jet *K*.—*N* is a small pipe to hold a piece of wax taper; *L*, a brass pillar, on the top of which is a ball of the same metal; *a* is a pillar of glass with a socket at top, in which the wire *b* slides, having a ball screwed on the end of it. *F* is a cock by which the ball *A* is filled with inflammable air, and which afterwards serves to confine the air, and what water falls from the basin *B* into the ball *A*.

To use this instrument, after having filled the reservoir *A* with pure inflammable air and the basin with water, turn the cocks *D* and *s*, and the water which falls from the basin *B* will force out some of the inflammable air, and cause it to pass through the jet *K* into the air. If an electric spark be made to pass from the brass ball *m* to that marked *n*, the inflammable jet which passes through the pipe *K* will be fired. To extinguish the lamp, first shut the cock *s*, and then the cock *D*. The inflammable air is made of the usual ingredients, viz. iron filings and vitriolic acid; and the reservoir is filled in the following manner: Having previously filled *A* with water, place the foot *R* in a tub of that fluid which may cover it, so that the bent glass tube through which the air passes may pass commodiously below the foot of the lamp. When the air has nearly driven out all the water, turn the cock *F*, and the apparatus is ready for use. This instrument is convenient for preserving a quantity of inflammable air ready for any occasional experiment, as charging the inflammable air-pistol, &c. It is also convenient for lighting a candle for economical purposes, as the least spark from an electrophorus or a small bottle is sufficient to fire the air.

XLVIII. Imitations of the Planetary Motions.

See below, *Uses of the Electric Fluid in the System of Nature.*

XLIX. Beautiful Figures produced in Powdered Rosin, &c. screwed over an Electric Substance. Ibid.

Miscellaneous Experiments.

SECT. IX. *Experiments of a Miscellaneous Nature, viz. those relating to the Effects of the Electric Fluid on Colours; on its Velocity; the Changes of Electric into Conducting Substances; the impossibility of forcing the Fluid through a perfect Vacuum; the Power of Batteries; its Direction in various Cases; Improvements in the Method of Excitation, &c.*

THESE experiments, though far from being unentertaining, we have thought proper to class under a different title, as many might wish to amuse themselves with producing an agreeable and beautiful phenomenon who would not choose to make experiments for the sake of investigating unknown subjects, where perhaps little else than the labour of making the experiment might be the reward of the operator. These experiments also may be truly said to be of an anomalous nature; as not being founded upon any known laws of electricity, but rather a collection of facts; from some of which we may afterwards deduce the laws by which this subtle fluid is occasionally governed. We shall begin with experiments made by Mr Cavallo upon substances painted over with colours of different kinds. They were occasioned by his having observed that an electric shock, sent over the surface of a card, made a black stroke upon a red spot, from which he was induced to try the effect of sending shocks over cards painted with different water-colours. The force employed was generally about one foot and an half of charged glass; and the shocks were sent over the cards while the latter were in a very dry state.

"Vermilion was marked with a strong black track, about one-tenth of an inch wide. This stroke is generally single, as represented by *AB*, fig. 74. n° 2. of Plate CLXXVII. Sometimes it is divided in two towards the middle, like *EF*; and sometimes, particularly when the wires are set very distant from one another, the stroke is not continued, but interrupted in the middle, like *GH*. It often, although not always, happens, that the impression is marked stronger at the extremity of that wire from which the electric fluid issues, as it appears at *E*, supposing that the wire *C* communicates with the positive side of the jar; whereas the extremity of the stroke, contiguous to the point of the wire *D*, is neither so strongly marked, nor surrounds the wire so much, as the other extremity *E*.

"Carmine received a faint and slender impression of a purple colour.

"Verdigris was shaken off from the surface of the card; except when it had been mixed with strong gum-water, in which case it received a very faint impression.

"White-lead was marked with a long black track, not so broad as that on vermilion.

"Red lead was marked with a faint mark much like carmine. Miscellaneous Experiments.

"The other colours I tried were orpiment, gamboge, sap-green, red-ink, ultramarine, Prussian blue, and a few others, which were compounds of the above; but they received no impression.

"It having been insinuated, that the strong black mark, which vermilion receives from the electric shock, might possibly be owing to the great quantity of sulphur contained in that mineral, I was induced to make the following experiment. I mixed together equal quantities of orpiment and flower of sulphur; and with this mixture, by the help, as usual, of very diluted gum-water, I painted a card; but the electric shock sent over it left not the least impression.

"Desirous of carrying this investigation on colours a little further, with a particular view to determine something relative to the properties of lamp-black and oil (*c*), I procured some pieces of paper painted on both sides with oil colours; and sending the charge of two feet of coated glass over each of them, by making the interruption of the circuit upon their surfaces, I observed that the pieces of paper painted with lamp-black, Prussian blue, vermilion, and purple brown, were torn by the explosion; but white lead, Naples yellow, English ochre, and verdigris, remained unhurt.

"The same shock sent over a piece of paper painted very thickly with lamp-black and oil left not the least impression. I sent the shock also over a piece of paper unequally painted with purple brown, and the paper was torn where the paint lay very thin, but remained unhurt where the paint was evidently thicker. These experiments I repeated several times and with some little variation, which naturally produced different effects; however, they all seem to point out the following propositions.

"I. A coat of oil-paint over any substance, defends it from the effects of such an electric shock as would otherwise injure it; but by no means defends it from any electric shock whatever. II. No one colour seems preferable to the others, if they are equal in substance, and equally well mixed with oil; but a thick coating does certainly afford a better defence than a thinner one.

"By rubbing the above mentioned pieces of paper, I find that the paper painted with lamp-black and oil is more easily excited, and acquires a stronger electricity, than the papers painted with the other colours; and, perhaps, on this account it may be, that lamp-black and oil might resist the shock somewhat better than the other paints.

"It is remarkable, that vermilion receives the black impression, when painted with linseed oil, nearly as well as when painted with water. The paper painted with white lead and oil receives also a black mark; but its nature is very singular. The track, when first made, is almost as dark as that marked on white-lead painted

(c) "It has often been observed, that when lightning has struck the masts of ships, it has passed over such parts of the masts as were covered with lamp-black and tar, or painted with lamp-black and oil, without the least injury, at the same time that it has shivered the uncoated parts in such a manner as to render the masts useless."

Fig. 68.



Fig. 70.

Fig. 71.



Fig. 72.

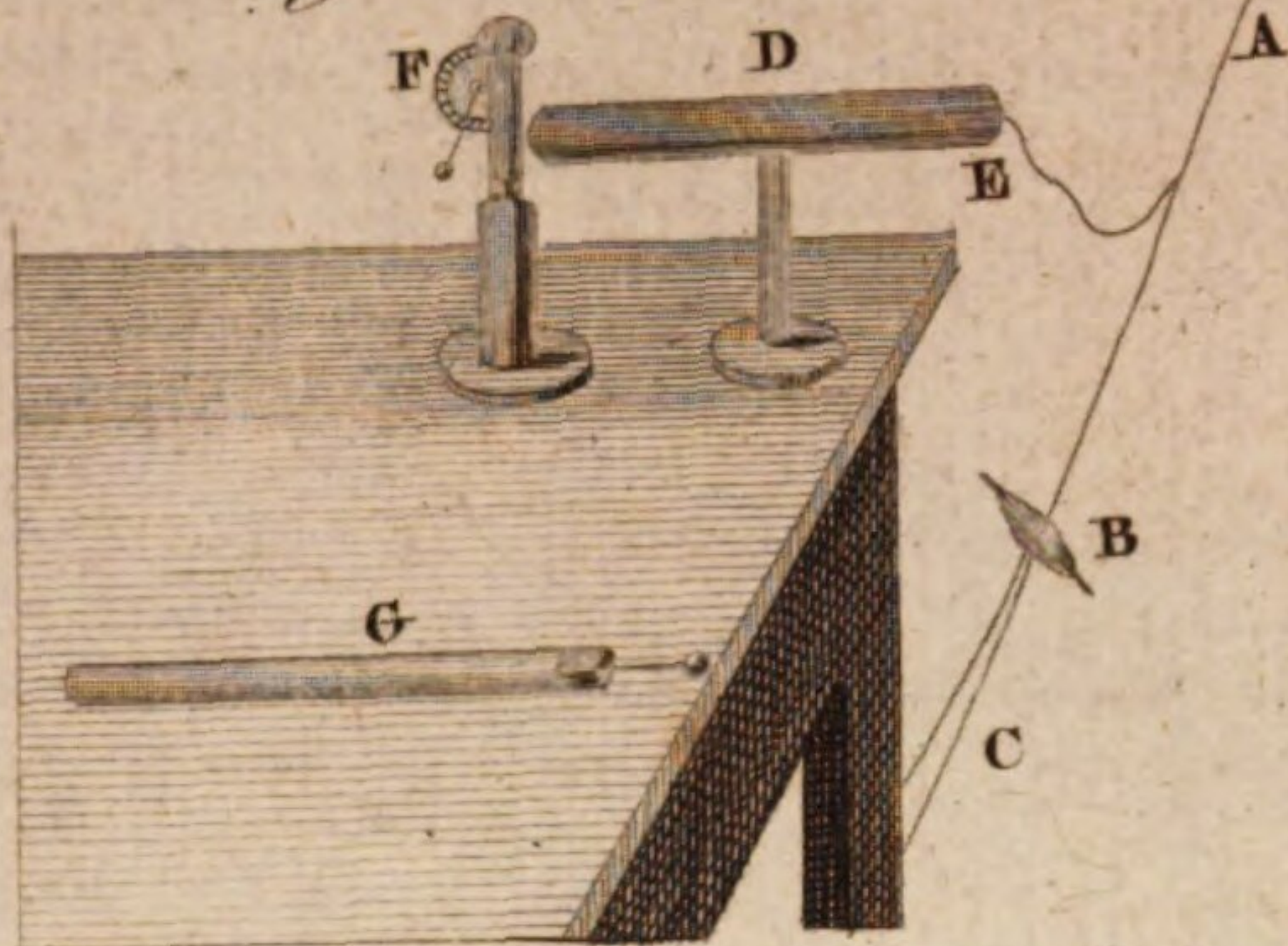


Fig. 74.



Fig. 67.

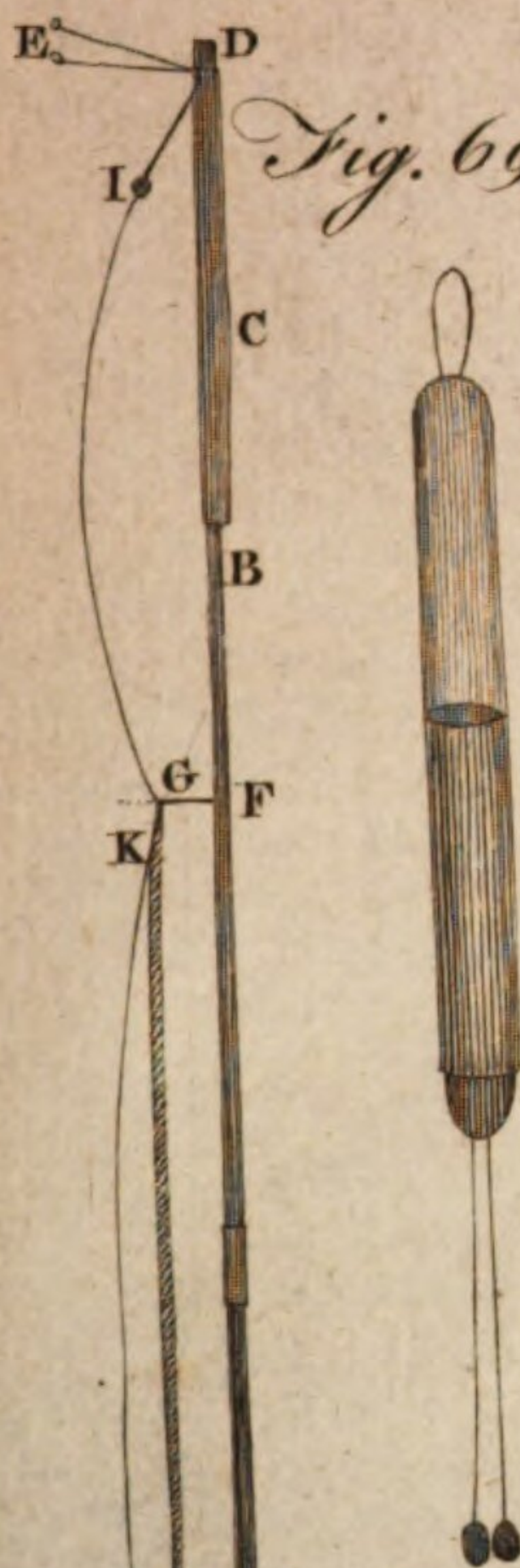


Fig. 69.

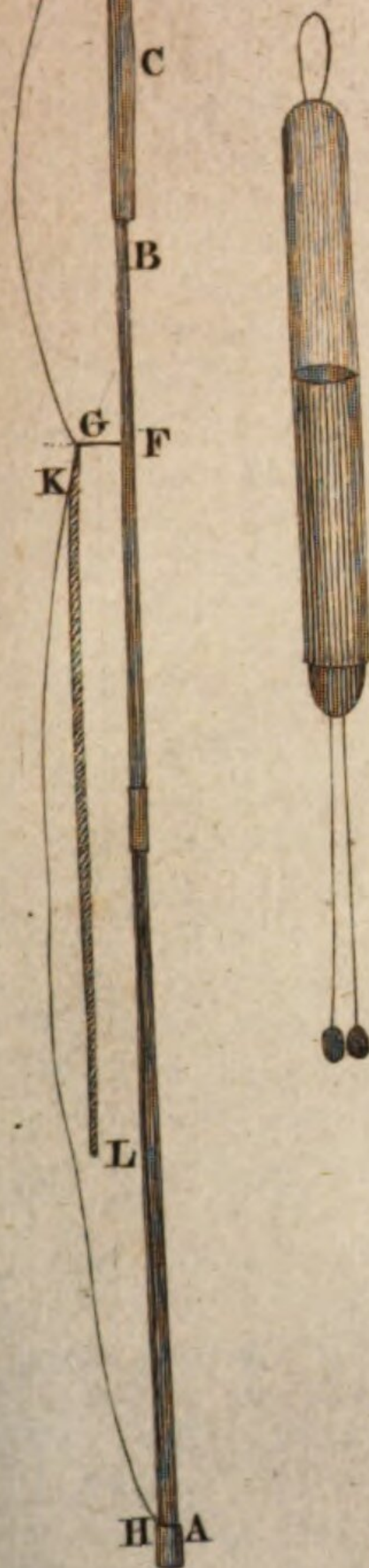


Fig. 73.

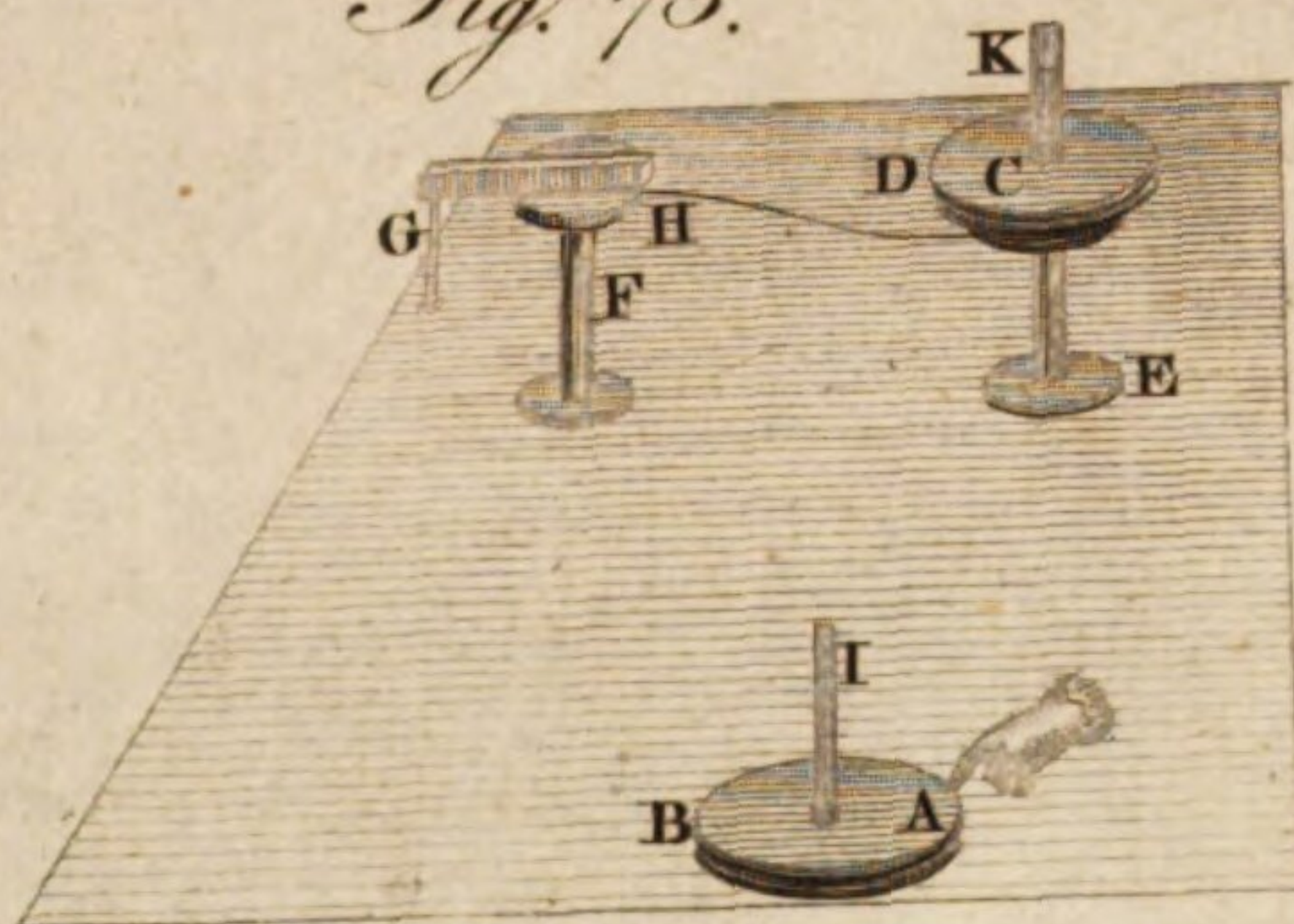


Fig. 75.

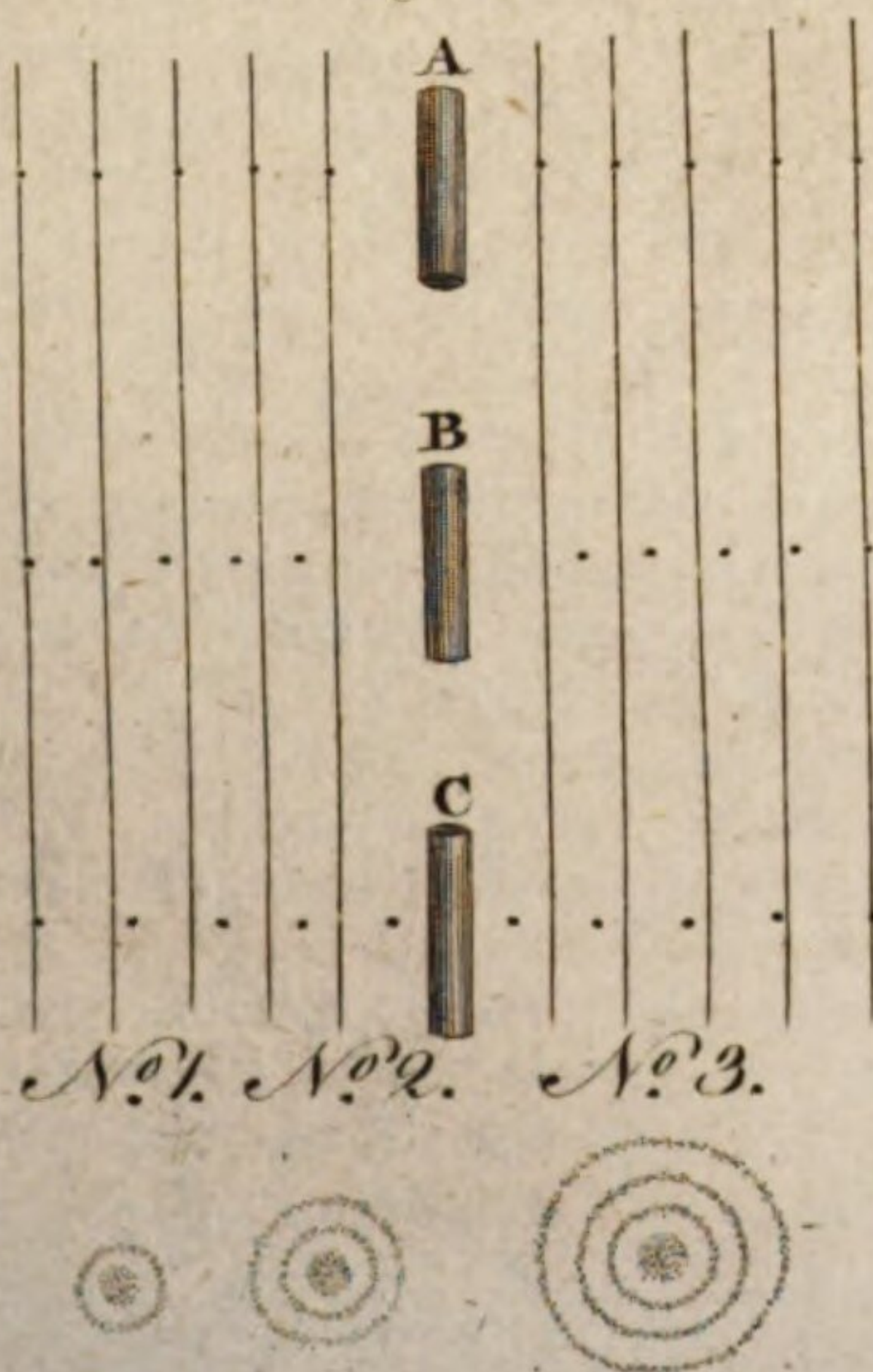


Fig. 78.



Fig. 77.

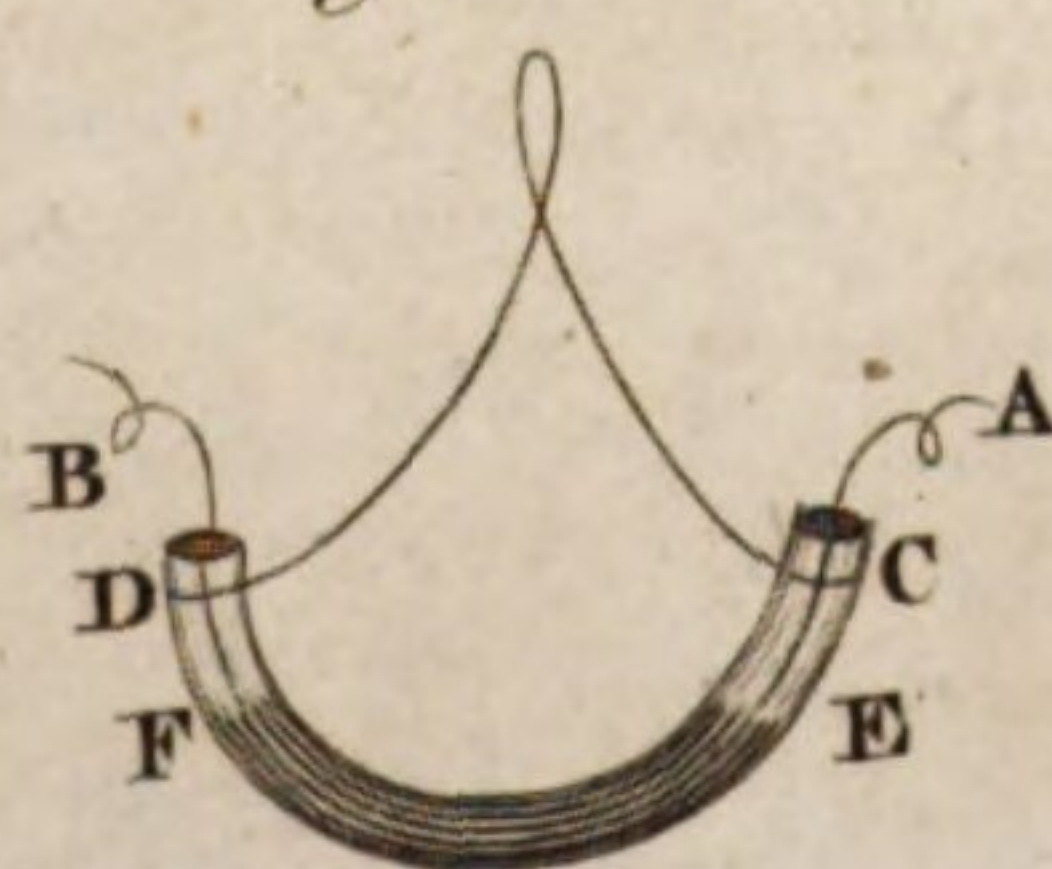


Fig. 76.



J. Belli Pin. Wals. Sculptor fecit.

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painted with water; but it gradually loses its blackness, and in about an hour's time (or longer, if the paint is not fresh) it appears without any darkness; and when the painted paper is laid in a proper light, appears only marked with a colourless track, as if made by a finger-nail. I sent the shock also over a piece of board which had been painted with white-lead and oil about four years before, and the explosion marked the black track upon this also: this track, however, was not so strong, nor vanished so soon, as that marked upon the painted paper; but in about two days time it also vanished entirely."

123
Electric shock calcines, vitrifies, and revivifies metals.

Another very remarkable property of the electric fluid is, that it both calcines, vitrifies, and revivifies, metals. The calcination of them appears from Dr Priestley's experiments with the brass chain, formerly mentioned, where the black dust was plainly a calx of the metal. The vitrification is performed by exploding small wires of any kind with the shock of a battery. In this case, the small globules of metal, even though gold, silver, or platina, are found to be completely vitrified. The revivification is an experiment of Mr Beccaria. This he did by making the explosion between two pieces of the calces; and thus he revivified several metallic substances, particularly zinc, and even produced real quicksilver from cinnabar. In this case, he always observed streaks of black beyond the coloured metallic stains; owing, as he supposed, to the phlogiston driven from the parts that were vitrified, when the other part revivified the calx.

124
Mr Beccaria's experiments to show that the electric matter throws light conducting substances before it.

Mr Beccaria also discovered another very remarkable property of the electric matter; namely, that when it is obliged to pass through air, or any other substance through which it makes its way with difficulty, it throws before it all light conducting substances it can find, in order to facilitate its own passage; and thus it will pass through a greater quantity of resisting medium than it would otherwise be able to do. The experiments from which Mr Beccaria drew this conclusion, were the following. He put a narrow piece of leaf-silver between two plates of wax, laying it across them, but so that it did not quite reach one of the sides. The discharge being made through this strip of metal, by bringing a wire opposite to the silver, at the place where it was discontinued; the silver was found melted, and part of it dispersed all along the track that the electric matter took between the plates of wax, from the silver to the wire. Happening once to receive, inadvertently, the charge of a small jar through some smoke of spirit of nitre, a hole was made in his thumb, where the fire entered, and which he thought could only have been made by the acid carried along by the electric fluid. Dr Priestley hath made several more experiments, in order to ascertain this remarkable property; and of which he gives the following account.

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Dr Priestley's experiments on this subject.

"I discharged frequent shocks, both of a common jar, and another of three square feet, through trains of brass dust, laid on a stool of baked wood, making interruptions in various parts of the train; and always found the brass dust scattered in the intervals, so as to connect the two disjointed ends of the train; but then it was likewise scattered nearly as much from almost all other parts of the train, and in all directions. The scattering from the train itself was probably occasioned by small electric sparks between the particles

of the dust; which, causing a vacuum in the air, drove all that light matter to a considerable distance. But the particles of the dust, which were strowed in the intervals of the train, some of which were at least three inches, could hardly be conveyed in that manner.

"When small trains were laid, the dispersion was the most considerable, and a light was very visible in the dark, illuminating the whole circuit. It made no difference, in any of these experiments, which way the shock was discharged.

"When I laid a considerable quantity of the dust at the ends of two pieces of chain, through which the shock passed, at the distance of about three inches from one another, the dust was always dispersed over the whole interval, but chiefly laterally; so that the greatest quantity of it lay in arches, extending both ways, and leaving very little of it in the middle of the path. It is probable, that the electric power would have spread it equably, but that the vacuum made in the air, by the passage of the fluid from one heap of dust to the other, dispersed it from the middle part.

"I then insulated a jar of three square feet, and upon an adjoining glass-stand laid a heap of brass dust; and at the distance of seven or eight inches a brass rod communicating with the outside of the jar. Upon bringing another rod, communicating with the inside, upon the heap of dust, it was dispersed in a beautiful manner, but not one way more than another. However, it presently reached the rod communicating with the outside.

"Making two heaps, about eight inches asunder, I brought one rod communicating with the inside upon one of them, and another rod communicating with the outside upon the other. Both the heaps were dispersed in all directions, and soon met; presently after which the jar was discharged, by means of this dispersed dust, in one full explosion. When the two heaps were too far asunder to promote a full discharge at once, a gradual discharge was made through the scattered particles of the dust.

"When one heap of dust was laid in the centre of the stand, and the two rods were made to approach on each side of it, they each attracted the dust from the side of the heap next to them, and repelled it again in all directions. When they came very near the heap, the discharge was made through it, without giving it any particular motion.

"All these experiments show, that light bodies possessed of a considerable share of electricity, disperse in all directions, carrying the electric matter to places not abounding with it; and that they sometimes promote a sudden discharge of great quantities of that matter from places where it was lodged, to places where there was a defect of it. But an accident led me to a much more beautiful, and perhaps a more satisfactory, manner of demonstrating the last part of this proposition, than any that I hit upon while I was pursuing my experiments with that design.

"Hanging a drop of water upon the knob of a brass rod communicating with the inside of my battery, in order to observe what variety it might occasion in the circular spots above mentioned, I was greatly surprised to find the explosion made all at once, at the distance of two inches.

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"I afterwards put some brass dust upon a plate of metal communicating with the inside of the battery; and making the discharge through the dust, it exploded at the distance of an inch and a half. The dust rose towards the discharged rod, and from thence was dispersed in all directions.

"These experiments are the more remarkable, as they demonstrate so great a difference between the distance at which the battery may be made to discharge at once, by the help of these light bodies, and without them. When the discharge of a battery by the knobs of brass rods, in the open air, is at the distance of about half an inch; it will, by this means, be made at about two inches."

126
Experiments concerning the velocity of the electric fluid.

The motions of the electric fluid, though prodigiously quick, are not instantaneous. The shock of the Leyden phial, indeed, hath been transmitted through wires of several miles in length, without taking up any sensible space of time. That is, supposing two persons to hold the ends of the wire, one communicating with the knob, and the other with the outside coating of the phial, both would feel the shock at the same instant; nor would it make any alteration though a considerable part of the surface of the ground was made part of the conductor. Dr Priestley relates several very curious experiments made with a view to ascertain this point soon after the Leyden phial was discovered. These experiments were planned and directed by Dr Watson, who was present at every one of them. His chief assistants were Martin Folkes, Esq; president of the royal society, Lord Charles Cavendish, Dr Bevis, Mr Graham, Dr Birch, Mr Peter Daval, Mr Trembley, Mr Ellicott, Mr Robins, and Mr Short. Many other persons, and some of distinction, gave their attendance occasionally.

Dr Watson, who wrote the history of their proceedings, in order to lay them before the royal society, begins with observing (what was verified in all their experiments), that the electric shock is not, strictly speaking, conducted in the shortest manner possible, unless the bodies through which it passes conduct equally well; for that, if they conduct unequally, the circuit is always formed through the best conductor, though the length of it be ever so great.

The first attempt these gentlemen made, was to convey the electric shock across the river Thames, making use of the water of the river for one part of the chain of communication. This they accomplished on the 14th and 18th of July 1747, by fastening a wire all along Westminster bridge, at a considerable height above the water. One end of this wire communicated with the coating of a charged phial, the other being held by an observer, who, in his other hand, held an iron rod, which he dipped into the river. On the opposite side of the river stood a gentleman, who likewise dipped an iron rod in the river with one hand; and in the other held a wire, the extremity of which might be brought into contact with the wire of the phial.

Upon making the discharge, the shock was felt by the observers on both sides the river, but more sensibly by those who were stationed on the same side with the machine; part of the electric fire having gone from the wire down the moist stones of the bridge, thereby making several shorter circuits to the phial, but still all

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passing through the gentlemen who were stationed on the same side with the machine. This was, in a manner, demonstrated by some persons feeling a sensible shock in their arms and feet, who only happened to touch the wire at the time of one of the discharges, when they were standing upon the wet steps which led to the river. In one of the discharges made upon this occasion, spirits were kindled by the fire which had gone through the river.

Upon this, and the subsequent occasions, the gentlemen made use of wires in preference to chains; for this, among other reasons, that the electricity which was conducted by chains was not so strong as that which was conducted by wires. This, as they well observed, was occasioned by the junctures of the links not being sufficiently close, as appeared by the snapping and flashing at every juncture where there was the least separation. These lesser snappings, being numerous in the whole length of a chain, very sensibly lessened the great discharge at the gun-barrel.

Their next attempt was to force the electrical shock to make a circuit of two miles, at the New River at Stoke Newington. This they performed on the 24th of July 1747, at two places; at one of which the distance by land was 800 feet, and by water 2000: in the other, the distance by land was 2800 feet, and by water 8000. The disposition of the apparatus was similar to what they before used at Westminster bridge, and the effect answered their utmost expectations. But as, in both cases, the observers at both extremities of the chain, which terminated in the water, felt the shock as well when they stood with their rods fixed into the earth 20 feet from the water, as when they were put into the river; it occasioned a doubt, whether the electric circuit was formed through the windings of the river, or a much shorter way, by the ground of the meadow: for the experiment plainly showed, that the meadow-ground, with the grass on it, conducted the electricity very well.

By subsequent experiments they were fully convinced, that the electricity had not in this case been conveyed by the water of the river, which was two miles in length, but by land, where the distance was only one mile; in which space, however, the electric matter must necessarily have passed over the New River twice, have gone through several gravel pits, and a large stubble field.

July 28th, they repeated the experiment at the same place, with the following variation of circumstances. The iron wire was, in its whole length, supported by dry sticks, and the observers stood upon original electrics; the effect of which was, that they felt the shock much more sensibly than when the conducting wire had lain upon the ground, and when the observers had likewise stood upon the ground, as in the former experiment.

Afterwards, every thing else remaining as before, the observers were directed, instead of dipping their rods into the water, to put them into the ground, each 150 feet from the water. They were both smartly struck, though they were distant from each other above 500 feet.

The same gentlemen, pleased with the success of their former experiments, undertook another, the object of which was, to determine whether the electric virtue

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virtue could be conveyed through dry ground; and, at the same time, to carry it through water to a greater distance than they had done before. For this purpose they pitched upon Highbury-barn beyond Islington, where they carried it into execution on the 5th of August 1747. They chose a station for their machine almost equally distant from two other stations for observers upon the New River; which were somewhat more than a mile asunder by land and two miles by water. They had found the streets of London, when dry, to conduct very strongly for about 40 yards; and the dry road at Newington about the same distance. The event of this trial answered their expectations. The electric fire made the circuit of the water, when both the wires and the observers were supported upon original electrics, and the rods dipped into the river. They also both felt the shock, when one of the observers was placed in a dry gravelly pit, about 300 yards nearer the machine than the former station, and 100 yards distant from the river: from which the gentlemen were satisfied, that the dry gravelly ground had conducted the electricity as strongly as water.

From the shocks which the observers received in their bodies, when the electric power was conducted upon dry sticks, they were of opinion, that, from the difference of distance simply considered, the force of the shock, as far as they had yet experienced, was very little if at all impaired. When the observers stood upon electrics, and touched the water or the ground with the iron rods, the shock was always felt in their arms or wrists; when they stood upon the ground with their iron rods, they felt the shock in their elbows, wrists, and ankles; and when they stood upon the ground without rods, the shock was always felt in the elbow and wrist of that hand which held the conducting wire, and in both ankles.

The last attempt of this kind which these gentlemen made, and which required all their sagacity and address in the conduct of it, was to try whether the electric shock was perceptible at twice the distance to which they had before carried it, in ground perfectly dry, and where no water was near; and also to distinguish, if possible, the respective velocity of electricity and sound.

For this purpose they fixed upon Shooter's-hill, and made their first experiments on the 14th of August 1747; a time when, as it happened, but one shower of rain had fallen during five preceding weeks. The wire communicating with the iron rod which made the discharge, was 6732 feet in length, and was supported all the way upon baked sticks; as was also the wire which communicated with the coating of the phial, which was 3868 feet long, and the observers were distant from each other two miles. The result of the explosion demonstrated, to the satisfaction of the gentlemen present, that the circuit performed by the electric matter was four miles, viz. two miles of wire and two of dry ground, the space between the extremities of the wires; a distance which, without trial, as they justly observed, was too great to be credited. A gun was discharged at the instant of the explosion, and the observers had stop-watches in their hands, to note the moment when they felt the shock: but, as far as they could distinguish, the time in which the electric matter performed that vast circuit might have been instantaneous.

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In all the explosions where the circuit was made of considerable length, it was observed, that though the phial was very well charged, yet that the snap at the gun-barrel, made by the explosion, was not near so loud as when the circuit was formed in a room; so that a by-stander, says Dr Watson, though versed in these operations, would not imagine, from seeing the flash, and hearing the report, that the stroke at the extremity of the conducting wire could have been considerable; the contrary whereof, when the wires were properly managed, he says, always happened.

Still the gentlemen, unwearied in these pursuits, were desirous, if possible, to ascertain the absolute velocity of electricity at a certain distance; because, though in the last experiment, the time of its progress was certainly very small, if any, they were desirous of knowing, small as that time might be, whether it was measurable; and Dr Watson had contrived an excellent method for that purpose.

Accordingly, on the 5th of August 1748, the gentlemen met once more, and the last time, at Shooter's-hill; when it was agreed to make an electric circuit of two miles, by several turnings of the wire in the same field. The middle of this circuit they contrived to be in the same room with the machine, where an observer took in each hand one of the extremities of the wires, each of which was a mile in length. In this excellent disposition of the apparatus, in which the time between the explosion and the shock might have been observed to the greatest exactness, the phial was discharged several times; but the observer always felt himself shocked at the very instant of making the explosion. Upon this the gentlemen were fully satisfied, that through the whole length of this wire, which was 12,276 feet, the velocity of the electric matter was instantaneous.

With all this surprising velocity, however, it is certain, that both sides of a charged phial may be touched so quickly, even by the best conductors, that all the electric matter hath not time to make the circuit, and the phial will remain but half discharged. If the upper plate of an electrophorus also is very suddenly touched with the finger, or any other conductor, a very small spark will be obtained on lifting it up; though a very strong one would be got if the finger was kept longer upon it. But how this seeming slowness can be reconciled with the immeasurable velocity above-mentioned, doth not appear. It is certain, indeed, that this fluid is considerably resisted in its passage through or over every substance. It will even prefer a short passage in the air where it is violently resisted to one along a wire of very great length; but here, as in every other case, it seems to divide its force, and to break out through several different passages at once. A method of ascertaining this hath been contrived by Dr Priestley, thus. Bend a wire, about five feet long, so that one part may come within half an inch of the other; then connect the extremities of the wire with the hook of the battery, and send a shock through it. On making the explosion, a spark will be seen between the two parts which approach nearest to each other; which shows that the fluid chooses a short passage through the air, rather than the long one through the wire. The charge, however, does not pass entirely between these two parts, but some of it goes also thro' the wire. This may be proved by putting a slender wire

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127 Sometimes the fluid seems to move more slowly.

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between the two approaching parts: for, on making the discharge with only this addition in the apparatus, the small wire will hardly be made red hot; whereas, if the large wire be cut so as to discontinue the circuit, the small wire will be melted, and even exploded, by the same shock that before made it scarcely red hot. But though we can easily show that the electric fluid always meets with resistance, it is by no means easy to show why the same resistance which puts a temporary stop to its motions in some cases, doth not so in all.

128
Water becomes electric by gold.

Another curious experiment in electricity is the converting of conducting substances into electrics by cold, and of changing electrics into conductors by heat. The first hath yet been done only in the instance of water. This is a discovery of Mr Achar's at Berlin, who, in the month of January 1776, observed, that water frozen to the 20th degree below the freezing point of Reaumur's thermometer, answering to the 13th below 0 of Fahrenheit's, is an electric. He tried his experiments in the open air, where he found, that a rod of ice two feet long and two inches thick, was a very imperfect conductor when Reaumur's thermometer was at six degrees below 0; and that it would not in the least conduct when the thermometer was sunk to 20°. By whirling a spheroid of ice in a proper machine, he even electrified the prime conductor so as to attract, repel, give sparks, &c. The ice made use of was free from air-bubbles, and quite transparent; to produce which, he used to set a vessel containing distilled water to be frozen, upon the window of a room which was rather warm with respect to the ambient air; so that the water began to freeze on the one side of the vessel, while on the other it was still liquid.

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Electrics become conductors by heat.

To prove that glass and other electrics become conductors when very hot: Take a small glass tube of about one-twentieth of an inch in diameter, and above a foot long; close it at one end, and introduce a wire into it, so that it may be extended through its whole length; let two or three inches of this wire project above the open end of the tube, and there fasten it with a bit of cork; tie round the closed end of the tube another wire, which will be separated from the wire within the tube only by the glass interposed between them. In these circumstances, endeavour to send a shock through the two wires, *i. e.* the wire inserted in the glass tube and that tied on its outside, by connecting one of them with the outside, and touching the other with the knob of a charged jar; and you will find that the discharge cannot be made unless the tube be broken; because the circuit is interrupted by the glass at the end of the tube, which is interposed between the two wires. But put that end of the tube to which the wire is tied into the fire, so that it may become just red-hot, then endeavour to discharge the jar again through the wires, and you will find that the explosion will be easily transmitted from wire to wire through the substance of the glass, which, by being made red-hot, is become a conductor.

In order to ascertain the conducting quality of hot resinous substances, oils, &c. bend a glass tube in the form of an arch *CEFD*, fig. 77. Plate CLXXVII; and tie a silk string *GCD* to it, which serves to hold it by

when it is to be set near the fire; fill the middle part of this tube with rosin, sealing-wax, &c. then introduce two wires *AE*, *BF*, through its ends, so that they may touch the rosin, or penetrate a little way in it. This done, let a person hold the tube over a clear fire, so as to melt the rosin within it; at the same time, by connecting one of the wires *A* or *B* with the outside of a charged jar, and touching the other with the knob of the jar, endeavour to make the discharge through the rosin, and you will observe, that while the rosin is cold, no shocks can be transmitted through it; but it becomes a conductor according as it melts; and when totally melted, then the shocks will pass through it very freely.

To show that hot air is a conductor, electrify one of the cork-ball electrometers suspended upon the stand fig. 13. of Plate CLXXIV. or electrify the prime conductor with the quadrant electrometer; then bring a red-hot iron within a sufficient distance of the electrometer or prime conductor, and you will find that they soon lose their electricity, which is certainly conducted by the hot air contiguous to the iron; for if the experiment be repeated with the same iron when cold, *i. e.* by bringing it within the same distance of the electrified electrometer or prime conductor, their electricity will not be conducted away as before. It has been observed, that a battery may be discharged by introducing a red-hot iron between two knobs interposed, and standing at some distance from each other in the circuit: but if, instead of iron, there be introduced a piece of red-hot glass between the knobs (the distance between them remaining as at first), the battery cannot be discharged: whence we may infer, that either hot air is not so good a conductor as has been imagined; or else, that air heated by iron is stronger with respect to its conducting power, than when heated by the red-hot glass.

The impossibility of forcing the electric fluid through a perfect vacuum, is a doctrine which militates so directly against the theory laid down in Sect. VI. that we cannot by any means omit a very full consideration of it. As this, however, would lead us here into a theoretical disquisition, we shall not enter into any explanation in this place, but defer what is to be said on that subject to the last section, where the uses of the electric fluid in the system of nature are considered. The experiment on which this supposition is founded, was originally made by Mr Walsh; who found that it was possible to cleanse a barometrical tube so perfectly of air, that no electric light would be visible in it upon agitating the mercury, as is the case with the common barometers. It has since been repeated to more advantage by Mr William Morgan, who from his observations has deduced some conclusions concerning the action of the electric fluid very inconsistent with that extensive operation which many philosophers have ascribed to it, and which is ascribed to it in various articles of this work. His experiment is published in the Phil. Trans. for 1785, which we shall here extract.

"The non-conducting power of a perfect vacuum, Mr Morgan's experiment on this subject. is a fact in electricity which has been much controverted among philosophers. The experiments made by Mr Walsh, F. R. S. in the double barometer tube clearly demonstrated the impermeability of the electric light through a vacuum; nor was it, I think, precipitate

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to conclude from them the impermeability of the electric fluid itself. But this conclusion has not been universally admitted; and the following experiments were made with the view of determining its truth or fallacy. When I first attended to the subject, I was not aware that any other attempts had been made besides those of Mr Walsh; and though I have since found myself to have been in part anticipated in one of my experiments, it may not perhaps be improper to give some account of them, not only as they are an additional testimony in support of this fact, but as they led to the observation of some phenomena which appear to be new and interesting.

Plate
CLXXVIII.
fig. 80.

"A mercurial gage *B*, about 15 inches long, carefully and accurately boiled till every particle of air was expelled from the inside, was coated with tin-foil five inches down from its sealed end *A*, and being inverted into mercury thro' a perforation *D*, in the brass cap *E*, which covered the mouth of the cistern *H*, the whole was cemented together, and the air was exhausted from the inside of the cistern thro' a valve *C* in the brass cap *E* just mentioned; which producing a perfect vacuum in the gage, afforded an instrument peculiarly well adapted for experiments of this kind. Things being thus adjusted, (a small wire *F* having been previously fixed on the inside of the cistern to form a communication between the brass cap *E* and the mercury *G*, into which the gage was inverted), the coated end was applied to the conductor of an electrical machine; and notwithstanding every effort, neither the smallest ray of light, nor the slightest charge, could ever be procured in this exhausted gage. I need not observe, that if the vacuum on its inside had been a conductor of electricity, the latter at least must have taken place; for it is well known, that if a glass tube be exhausted by an air-pump, and coated on the outside, both light and a charge may very readily be procured. If the mercury in the gage be imperfectly boiled, the experiment will not succeed; but the colour of the electric light, which, in air rarefied by an exhauster, is always violet or purple, appears in this case of a beautiful green; and what is very curious, the degree of the air's rarefaction may be nearly determined by this means: for I have known instances, during the course of these experiments, where a small particle of air having found its way into the tube *B*, the electric light became visible, and as usual of a green colour; but the charge being often repeated, the gage has at length cracked at its sealed end, and in consequence the external air, by being admitted into the inside, has gradually produced a change in the electric light from green to blue, from blue to indigo, and so on to violet and purple, till the medium has at last become so dense as no longer to be a conductor of electricity. I think there can be little doubt from the above experiments, of the non-conducting power of a perfect vacuum; and this fact is still more strongly confirmed by the phenomena which appear upon the admission of a very minute particle of air into the inside of the gage. In this case the whole becomes immediately luminous upon the slightest application of electricity, and a charge takes place, which continues to grow more and more powerful in proportion as fresh air is admitted, till the density of the conducting medium arrives at its maximum, which it always does when the colour of the electric light is indigo or violet. Under

these circumstances the charge may be so far increased as frequently to break the glass. In some tubes, which have not been completely boiled, I have observed that they will not conduct the electric fluid when the mercury is fallen very low in them; yet upon letting in air into the cistern, so that the mercury shall rise in the gage, the electric fluid, which was before latent in the inside, shall now become visible; and as the mercury continues to rise, and of consequence the medium is rendered less rare, the light shall grow more and more visible, and the gage shall at last be charged, notwithstanding it has not been near an electrical machine for two or three days. This seems to prove, that there is a limit even in the rarefaction of air, which sets bounds to its conducting power; or, in other words, that the particles of air may be so far separated from each other as no longer to be able to transmit the electric fluid; that if they are brought within a certain distance of each other, their conducting power begins, and continually increases till their approach also arrives at its limit, when the particles again become so near as to resist the passage of the fluid entirely, without employing violence, which is the case in common and condensed air, but more particularly in the latter.

"It is surprising to observe how readily an exhausted tube is charged with electricity. By placing it at 10 or 12 inches from the conductor, the light may be seen pervading its inside, and as strong a charge may sometimes be procured as if it were in contact with the conductor: nor does it signify how narrow the bore of the glass may be; for even a thermometer tube, having the minutest perforation possible, will charge with the utmost facility; and in this experiment the phenomena are peculiarly beautiful.

"Let one end of a thermometer tube be sealed hermetically; let the other end be cemented into a brass cap with a valve, or into a brass cock, so that it may be fitted to the plate of an air-pump. When it is exhausted, let the sealed end be applied to the conductor of an electrical machine, while the other end is either held in the hand or connected to the floor. Upon the slightest excitation the electric fluid will accumulate at the sealed end, and be discharged through the inside in the form of a spark, and this accumulation and discharge may be incessantly repeated till the tube is broken. By this means I have had a spark 42 inches long; and had I been provided with a proper tube, I do not doubt but that I might have had a spark of four times that length. If, instead of the sealed end, a bulb be blown at that extremity of the tube, the electric light will fill the whole of that bulb, and then pass through the tube in the form of a brilliant spark, as in the foregoing experiment: but in this case I have seldom been able to repeat the trials above three or four times before the charge has made a small perforation in the bulb. If, again, a thermometer filled with mercury be inverted into a cistern, and the air exhausted in the manner I have described for making the experiment with the gage, a Torricellian vacuum will be produced; and now the electric light in the bulb, as well as the spark in the tube, will be of a vivid green; but the bulb will not bear a frequent repetition of charges before it is perforated in like manner as when it has been exhausted by an air-pump. It can hardly

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Surprising ease with which an exhausted tube is charged with electricity.

132
Changes of colour in the electric light by the admission of air.

134
Tube perforated by the electric spark.

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135
Why the fluid assumes the form of a spark.

be necessary to observe, that in these cases the electric fluid assumes the appearance of a spark (D), from the narrowness of the passage through which it forces its way. If a tube 40 inches long be fixed into a globe 8 or 9 inches in diameter, and the whole be exhausted, the electric fluid, after passing in the form of a brilliant spark throughout the length of the tube, will, when it gets into the inside of the globe, expand itself in all directions, entirely filling it with a violet and purple light, and exhibiting a striking instance of the vast elasticity of the electric fluid.

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Great difficulty in making this experiment.

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Electric fluid supposed not to reach beyond the atmosphere of the earth.

"I cannot conclude this paper without acknowledging my obligations to the ingenious Mr Brook of Norwich, who by communicating to me his method of boiling mercury, has been the chief cause of my success in these experiments (E). I have lately learned from him, that he has also ascertained the non-conducting power of a perfect vacuum; but what steps he took for that purpose, I know not. Of his accuracy, however, I am so well convinced, that had I never made an experiment myself, I should, upon his testimony alone, have been equally assured of the fact. To most of the preceding experiments Dr Price, Mr Lane, and some others of my friends, have been eye-witnesses; and I believe that they were as thoroughly satisfied as myself with the results of them. I must beg leave to observe to those who wish to repeat them, that the first experiment requires some nicety, and no inconsiderable degree of labour and patience. I have boiled many gages for several hours together without success, and was for some time disposed to believe the contrary of what I am now convinced to be the truth. Indeed, if we reason *a priori*, I think we cannot suppose a perfect vacuum to be a perfect conductor without supposing an absurdity: for if this were the case, either our atmosphere must have long ago been deprived of all its electric fluid, by being every where surrounded by a boundless conductor, or this fluid must pervade every part of infinite space; and consequently there can be no such thing as a perfect

vacuum in the universe. If, on the contrary, the truth of the preceding experiments be admitted, it will follow, that the conducting power of our atmosphere increases only to a certain height, beyond which this power begins to diminish, till at last it entirely vanishes; but in what part of the upper regions of the air these limits are placed, I will not presume to determine. It would not perhaps have been difficult to have applied the results of some of these experiments to the explanation of meteors, which are probably owing to an accumulation of electricity. It is not, however, my present design to give loose to my imagination. I am sensible, that by indulging it too freely, much harm is done to real knowledge; and therefore, that one fact in philosophy well ascertained, is more to be valued than whole volumes of speculative hypotheses."

A fact so contrary to the generally received opinion of the conducting powers of a vacuum, could not but excite a general surprise, and attempts to repeat the experiment would no doubt be ardently wished for. Unfortunately, however, the experiment itself, as must evidently appear from the account given of it by Mr Morgan, is of such a precarious nature, as must undoubtedly discourage any ordinary electrician from attempting it; for in the first place, there is no hope of success without a very tedious boiling of mercury in a tube for several hours; and even when this is done, the instrument will not remain in a state of perfection for any length of time. Mr Cavallo, who has greatly improved the air-pump, gives an account of some very curious experiments made with this instrument, in order to ascertain the truth of Mr Morgan's position; which we shall likewise give in his own words, with the conclusions he draws from them.

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Cavallo's experiments with an improved air-pump.

"I. In a glass receiver, of six inches diameter and nine inches in height, having a brass cap, a brass wire of two-tenths of an inch in diameter was fixed to its cap, and proceeding through the middle of the receiver, its lower extremity was five inches distant from the aperture of the receiver, and of course of the plate of

(D) "By cementing the string of a guitar into one end of a thermometer tube, a spark may be obtained as well as if the tube had been sealed hermetically."

(E) "Mr Brook's method of making mercurial gages is nearly as follows: Let a glass tube *L*, (fig. 81.) sealed hermetically at one end, be bent into a right angle within two or three inches of the other end. At the distance of about an inch or less from the angle, let a bulb *K*, of about $\frac{1}{4}$ ths of an inch in diameter, be blown in the curved end, and let the remainder of this part of the tube be drawn out *L*, so as to be sufficiently long to take hold of when the mercury is boiling. The bulb *K* is designed as a receptacle for the mercury, to prevent its boiling over; and the bent figure of the tube is adapted for its inversion into the cistern: for by breaking off the tube at *M* within $\frac{1}{8}$ th or $\frac{1}{4}$ th of an inch of the angle, the open end of the gage may be held perpendicular to the horizon when it is dipped into the mercury in the cistern, without obliging us to bring our finger or any other substance into contact with the mercury in the gage, which never fails to render the instrument imperfect. It is necessary to observe, that if the tube be 14 or 15 inches long, I have never been able to boil it effectually for the experiments mentioned in this paper in less than three or four hours, although Mr Brook seems to prescribe a much shorter time for the purpose; nor will it even then succeed, unless the greatest attention be paid that no bubbles of air lurk behind, which to my own mortification I have frequently found to have been the case: but experience has at length taught me to guard pretty well against this disappointment, particularly by taking care that the tube be completely dry before the mercury is put into it; for if this caution be not observed, the instrument can never be made perfect. There is, however, one evil which I have not yet been able to remedy; and that is, the introduction of air into the gage, owing to the unboiled mercury in the cistern: for when the gage has been a few times exhausted, the mercury which originally filled it becomes mixed with that into which it is inverted, and in consequence the vacuum is rendered less and less perfect, till at last the instrument is entirely spoiled. I have just constructed a gage so as to be able to boil the mercury in the cistern, but have not yet ascertained its success."

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of the air-pump, when the receiver was placed upon it. A fine linen thread was fastened towards the top of the wire, and about four inches of it hanged freely along the brass wire, and almost in contact with it. The extremity of the wire, which passing through the brass cap projected out of the receiver, was furnished with a ball. Thus prepared, the receiver was placed upon the plate of the pump, without any leather, or any thing else besides a little oil on its outside edge, which must be always understood in all the other experiments related in the course of this chapter. Then the exhaustion was commenced, and at intervals some electricity was communicated, either by the approach of the conductor of an electrical machine, or the knob of a charged jar, to the brass ball of the wire, in order to observe the strength of the repulsion of the thread from the wire in different degrees of rarefaction; which degrees were ascertained by the short barometrical gage. Proceeding in this manner, it was observed, that till the rarefaction did not exceed one hundred, to wit, till the air remaining within the receiver was not less than the hundredth part of the original quantity, whenever the electricity was communicated to the brass ball, the thread first adhered to the wire, and then was repelled by it; though this repulsion became smaller and smaller, according as the exhaustion came nearer to the above mentioned degree. The clinging of the thread to the wire first, was because being dry, it required some time before it acquired a sufficient quantity of electricity from the wire, and consequently it was not immediately repelled. When the air within the receiver was exhausted above 100 times, the thread was not first attracted and then repelled as before, but only vibrated a little backwards and forwards, and then remained in the situation in which it stood when electricity was not concerned. By exhausting the receiver still farther, the vibration of the thread when electrified was gradually diminished; so that when the degree of rarefaction was above 500, sparks and the discharge of a jar only made the thread vibrate in a manner just sensible; but this vibration, however small, did never become quite insensible, even when the receiver was exhausted to the utmost power of the pump, which was very near 1000. After this the air was gradually admitted into the receiver, and at various intervals the ball of the brass wire was electrified, in order to observe whether the same phenomena appeared at the different degrees of exhaustion as had done before; and they were found to agree with sufficient exactness.

"II. The brass wire within the same glass receiver was made very short, and from its extremity a fine linen thread, sixes inches long, was suspended; and upon the plate of the pump a small brass stand with a brass pillar was placed: so that when the receiver was put upon the plate, and over the brass stand, about one inch length of the thread stood parallel to, and at various required distances from, the brass pillar (F). In this disposition of the apparatus, whenever any the least quantity of electricity was communicated to the knob of the brass wire, the thread was immediately attracted

by the brass pillar, and adhered to it some time, because, being dry, it did not immediately part with the acquired electricity. At various degrees of exhaustion, the electricity being communicated to the brass ball of the wire, it was found, that the thread was always attracted by the brass pillar, though from a greater or less distance, according as a greater or less quantity remained within the receiver. Thus when the air was rarefied about 100 times, the thread was attracted from about one inch; when the air was rarefied 200 times, it was attracted from about $\frac{1}{2}$ th of an inch; when the air was rarefied 300 times, it was attracted from about $\frac{1}{3}$ th; and after this it was always attracted from about $\frac{1}{5}$ th, even when the air within the receiver was rarefied about 1000 times. It is remarkable, that when the air in the receiver is rarefied about 300 times, if a jar is discharged thro' the vacuum, by touching its knob with the ball of the wire on the receiver, the thread is not in consequence of it attracted by the brass pillar: the reason of which seems to be, because that large quantity of electricity opens a way thro' the vacuum, and passes thro' every part of it; whereas a small quantity of electricity, even the action of a small electrical machine in the same room, at no very great distance from the apparatus, will cause the thread being attracted by the brass pillar.

III. "The brass stand, with the pillar, and the thread which proceeded from the wire, being removed from under the receiver, a very sensible electrometer was fastened, instead of the thread, to the extremity of the brass wire. This electrometer consisted of two very fine silver wires, each about one inch long, and having a small cone of cork at its extremity. The sensibility of such an electrometer is really surprising; for even the electricity of a single hair excited, does sensibly affect it; and, as its suspension is almost without any friction or other impediment, it never deceives one by appearing to be electrified when in reality it is not so. With this preparation, the receiver being placed upon the plate of the air-pump, the air was gradually exhausted, and at intervals some electricity was communicated to the ball on the outside of the receiver, either by an excited electric or by a charged jar; and it was found that the corks of the electrometer were always made to diverge by it, even when the air was exhausted as much as possible. Indeed their divergency was smaller and smaller, and lasted a shorter time, according as the air was more exhausted, but it was visible to the last.

"In this experiment, analogous to what has been observed in the preceding, when the air was exhausted above 300 times, if a jar was discharged through the vacuum, or a strong spark was given to the knob on the top of the receiver, the corks of the electrometer diverged very little indeed, and but for an instant; whereas a small quantity of electricity made them diverge more, and remain much longer in that state.

"It seems deducible from those experiments, that electric attraction and repulsion take place in every degree of rarefaction, from the lowest to about 1000, but that the power diminishes in proportion as the air

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(F) This distance was altered by turning the brass wire which passed through a collar of leather in the brass cap of the receiver.

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air is more and more rarefied; and by following the law, we may perhaps conclude with F. Beccaria, that there is no electric attraction nor repulsion in a perfect vacuum: though this will perhaps be impossible to be verified experimentally; because when in an exhausted receiver no attraction or repulsion is observed between bodies to which electricity is communicated, it will be only suspected, that those bodies are not sufficiently small and light. But if we consult reason, and which alone ought to assist us when decisive experiments are not practicable, it seems likely that electric attraction and repulsion cannot take place in a perfect vacuum, by which I only mean a perfect absence of air; because either this vacuum is a conductor or a non-conductor of electricity. If a conductor, and nearer to perfection as it becomes more free from air, it must be a perfect conductor at the same time that it becomes a perfect vacuum; in which case electric attraction or repulsion cannot take place amongst bodies inclosed in it: for, according to every notion we have of electricity, those motions indicate or are the consequence of the intervening space in some measure obstructing the free passage of the electric fluid. And if the perfect vacuum is a perfect non-conductor, then neither electric attraction nor repulsion can happen in it.

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Electric light always visible in the most perfectly exhausted receiver.

"IV. In my former experiments, having always observed the electric light in the receiver of the air-pump, even when the air was rarefied to the utmost power of that machine, I thought proper to repeat that experiment with receivers of various sizes; and accordingly have used receivers of above two feet in height, and some of as large a diameter as the plate of the pump could admit, which is about 14 inches; but the light in it was always visible, only with different colours in different degrees of exhaustion, and always more diffused, and at the same time less dense, when the air was more rarefied; which seems to render it probable, that when the air is quite removed from any space, the electric light is no longer visible in it, as must have been the case with the experiment of Mr Walsh's double barometer; for it is a maxim very well established in electricity, that the electric light is only visible when the electric fluid, in passing from one body to another, meets with some opposition in its way; and according to this proposition, when the air is entirely removed from a given receiver, the electric fluid passing through that receiver cannot show any light, because it meets with no opposition; but this will not account for the receiver ever becoming a non-conductor.

"Having just mentioned, that according as the air is more and more rarefied in a receiver, so the electric light becomes gradually more faint, it will be proper to add, that the electric light is more diffused and less bright in an exhausted receiver than in air: Thus, when the receiver is not exhausted, the discharge of a jar through some part of it will appear like a small globule exceedingly bright; but when the receiver is exhausted, the discharge of the same jar will fill the whole receiver with a very faint light: whereas some persons, by seeing the whole receiver illuminated, are apt to say that the light of electricity is rendered stronger and greater by the exhaustion.

"V. It is mentioned by Mr Nairne, in the 67th vol.

of the Phil. Transf. that having put a piece of leather, just as it comes from the leather-sellers, into the receiver of an air pump, and afterwards having rarefied the air in it 148 times, the electric light appeared very faint in it; whereas, without the leather, and even when the air was much more rarefied, the light of the electric fluid, when made to pass through the receiver, was much more apparent. In consequence of this observation, I suspected that a little moisture in the receiver, or some other effluvia of substances, might perhaps prevent the appearance of the electric light in rarefied air; and with this view I began to put various substances successively into the receiver; and after rarefying the air by working the pump, some electric fluid was made to pass through the receiver.

"When a piece of moist leather was put into the receiver, the air could not be rarefied above 100 times, and the electric light appeared divided into a great many branches; though at the same time another sort of faint light filled up the whole cavity of the receiver.

"When a linen rag, moistened with a mixture of spirit of wine and water, was put into the receiver, the pump could not exhaust above 40 times, and the light of electricity appeared divided into many branches.

"A wine-glass full of olive oil placed under the receiver, prevented very little the exhaustion of the pump, the air being rarefied above 400 times. The electric light appeared exactly as it usually does in the same degree of rarefaction when no oil is under the receiver, viz. a uniform faint light inclining to purple or red.

"Concentrated vitriolic acid placed in a glass under the receiver, produced no particular effect. As for the other mineral acids, they were not tried, because, being volatile, they would have damaged the pump.

"Dry solids, that had a considerable smell, as sulphur, aromatic woods previously made very dry, and some resins, produced no particular effect, any more than some of them prevented a very great degree of exhaustion, owing to some moisture which still adhered to them.

"From these experiments it appears, first, that in the utmost rarefaction that can be effected by the best air-pump, which amounts to about 1000, both the electric light and the electric attraction, though very weak, are still observable: but, secondly, that the attraction and repulsion of electricity become weaker in proportion as the air is more rarefied, and in the same manner the intensity of the light is gradually diminished. Now by reasoning on this analogy we may conclude, that both the attraction and the light will cease in a perfect absence of air: but this will never account for this perfect vacuum ever becoming a non-conductor of electricity; for since the electric fluid is very elastic, and expands itself with more and more freedom in proportion as the resistance of the air is removed, it seems unnatural that it should be incapable of pervading a perfect vacuum: however, the fact seems to be fully ascertained by Mr Walsh and Mr Morgan; and the only thing that remains to be done is to investigate the cause of so remarkable a property."

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Prodigious power of the battery applied to the great machine in Teyler's museum.

With regard to the power of the electric fluid, we have already had occasion to speak in various parts of this treatise, and particularly to mention the machine in Teyler's Museum at Haarlem, as that which was capable of accumulating the greatest quantity of electricity that had ever been done artificially. Some of the effects of this machine, without any battery, have already been described; and those which follow are equally calculated to give an idea of its vast power. A battery of 135 vials, containing among them about 130 square feet of coated surface, was charged by about 100 turns of the glass plates; the discharge of which melted an iron wire 15 feet long and $\frac{1}{177}$ of an inch diameter; and another time they melted a wire of the same metal 25 feet long and $\frac{1}{240}$ th of an inch in diameter. With such an extraordinary power they tried to give polarity to needles made out of watch-springs of three and even six inches in length, and likewise to steel bars nine inches long, from a quarter to half an inch in breadth, and about the twelfth-part of an inch in thickness. The result was, that when the bar or needle was placed horizontally in the magnetic meridian, whichever way the shock entered, the end of the bar that stood towards the north acquired the north polarity, or the power of turning towards the north when freely suspended, and the opposite end acquired the south. If the bar, before it received the shock, had some polarity, and was placed with its poles contrary to the usual direction, then its natural polarity was always diminished, and often reversed; so that the extremity of it, which in receiving the shock looked towards the north, became the north pole, &c.

When the bar or needle was struck standing perpendicularly, its lowest end became the north pole in any case, even when the bar had some magnetism before, and was placed with the south pole downwards. All other circumstances being alike, the bars seemed to acquire an equal degree of magnetic power, whether they were struck whilst standing horizontally in the magnetic meridian, or perpendicular to the horizon.

When a bar or needle was placed in the magnetic equator, whichever way the shock entered, it never gave it any magnetism; but if the shock was given through its width, then the needle acquired a considerable degree of magnetism, and the end of it which lay towards the west became the north pole, and the other end the south pole.

If a needle or bar, already magnetic, or a real magnet, was struck in any direction, its power was always diminished. For this experiment, they tried considerably large bars; one being 7,08 inches long, 0,26 broad, and 0,05 thick.

When the shock was so strong, in proportion to the size of the needle, as to render it hot, then the needle generally acquired no magnetism at all, or very little.

The experiments lastly tried with this very powerful battery were concerning the calcination of metallic substances, and the revivification of their calces. It appears that the electric shock produced both these apparently contradictory effects.

The metallic calces used in those experiments were of the purest sort; they were confined between glasses whilst the shock was passed over them. By this means the calces were so far revived as to exhibit several

grains of the metal, large enough to be discerned by the naked eye, and to be easily separated from the rest.

As to the calcination of metals, whenever a shock was employed much greater than that which was necessary to fuse the metal, part of the metal was calcined, and dispersed into smoke. It is remarkable, that this calcination or smoke generally produced several filaments, of various lengths and thicknesses, which swam in the air. It was farther observed, that those flying filaments of metallic calx, if a conductor was presented to them, were soon attracted by it; but after the first contact, they were instantly repelled, and generally broke into diverse parts.

Even this vast power was not the utmost effect of the machine. Dr Van Marum, whom we have already mentioned as principally concerned in making the experiments, thinking that it was capable of charging a larger surface, added to it 90 jars, each of the same size with the former; so that his grand battery is now a square of 15 jars every way, and contains 225 square feet of coated glass. To ascertain the degree of the charge, he uses the electrometer invented by Mr Brook, to be afterwards described, which is fixed in the centre of the battery, at the height of four feet above the knobs of the jars.

His first object was to try whether this battery could be fully charged by the machine, and whether its increase of power was proportional to the augmentation of its surface. In these respects, his expectations were fully answered. The former battery discharged itself over the uncoated part of the jars after 96 revolutions; and the present did the same after 160 turns of the machine. With the former battery, the Doctor had split a cylinder of box three inches in diameter and three inches in length, the section of which, through its axis, contained nine square inches. With the 225 jars, he split a similar cylinder, four inches in diameter and four inches in height, the section of which was 16 square inches. He found that to split a square inch of this wood in the same direction, required a force equal to 615 pounds; and hence calculates that the power of this explosion was not less than 9840 pounds.

The apparent resemblance between the effects of electricity and of fire, especially in melting metals, has led many to suppose that they act upon bodies in a similar manner. In order to examine whether this supposition be just, Dr Van Marum caused wires of different metals to be drawn through the same hole, of one thirty-eighth part of an inch in diameter, and observed how many inches of each could be melted by the explosion of his battery; taking care, in all these experiments, to charge it to the same degree as ascertained by his electrometer. The results were as follow:

Of lead he melted	-	120 inches.
Of tin	-	120
Of iron	-	5
Of gold	-	3 $\frac{1}{2}$
Of silver, copper, and brass, not quite a quarter of an inch.		

These several lengths of wire, of the same diameter, melted by equal explosions, indicate, according to our author, the degree in which each metal is fusible by the

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The battery augmented.

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Calculation of the force of its explosion.

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the electrical discharge; and if these be compared with the fusibility of the same metals by fire, a very considerable difference will be observed. According to the experiments of the academicians of Dijon, to melt tin required a heat of 172 degrees of Reaumur's thermometer.

Lead	-	-	-	230
Silver	-	-	-	430
Gold	-	-	-	563
Copper	-	-	-	630
Iron	-	-	-	696

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Electrical fluid supposed to act in a different manner from fire.

Thus tin and lead appear to be equally fusible by electricity, but not by fire: and iron, which by fire is less fusible than gold, is much more so by the electrical explosion. From these and some other experiments of the same kind, Dr Van Marum concludes, that, in melting metals, the electrical fluid acts upon them in a manner very different from the action of fire, and that the supposed analogy between these two powerful agents cannot be proved, either from the fusion of metals, or the ignition of combustible substances.

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Comparative efficacy of the different metals as conductors

By these experiments on the fusibility of metals, Dr Van Marum was induced to make trial of the comparative efficacy of lead, iron, brass, and copper, as conductors to preserve buildings from lightning. In this respect, he found that a leaden conductor ought to be four times the size of one of iron, in order to be equal in point of safety. He has also fully proved the superiority of rods to chains, and of copper to iron, for this important use.

When iron wire is melted by the explosion of the battery, the red-hot globules are thrown to a very considerable distance, sometimes to that of 30 feet: this the Doctor justly ascribes to the lateral force exerted by the electrical fluid. It is, however, remarkable, that the thicker the wire is which is melted, the further are the globules dispersed: but this is accounted for, by observing, that the globules, formed by the fusion of thinner wires, being smaller, are less able to overcome the resistance of the air, and are therefore sooner stopped in their motion.

Two pieces of iron wire being tied together, the fusion extended no further than from the end connected with the inside coating of the jars to the knot; tho' wire of the same length and thickness, when in one continued piece, had been entirely melted by an equal explosion.

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Wires shortened by the discharge.

When a wire was too long to be melted by the discharge of the battery, it was sometimes broken into several pieces, the extremities of which bore evident marks of fusion; and the effect of electricity in shortening wire was very sensible in an experiment made with 18 inches of iron wire $\frac{1}{8}$ th of an inch in diameter, which, by one discharge, lost a quarter of

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Very small wires cannot discharge the battery entirely.

an inch of its length. An explosion of this battery through very small wires, of nearly the greatest length that could be melted by it, did not entirely discharge the jars. On transmitting the charge through 50 feet of iron wire of $\frac{1}{8}$ th of an inch diameter, the Doctor found that the residuum was sufficient to melt two feet of the same wire; but this residuum was much less when the wire was of too great a length to be melted by the first discharge. After an explosion of the battery through 180 feet of iron wire, of equal

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diameter with the former, the residuum was discharged through 12 inches of the same wire, which it did not melt, but only blued.

Twenty-four inches of leaden wire $\frac{1}{8}$ th of an inch in diameter, were entirely calcined by an explosion of this battery; the greater part of the lead rose in a thick smoke, the remainder was struck down upon a paper laid beneath it, where it formed a stain, which resembled the painting of a very dark cloud. When shorter wires were calcined, the colours were more varied. A plate is given of the stain made by the calcination of eight inches of this wire, in which the cloud appears variously shaded with different tints of green, gray, and brown, in a manner of which no description can give an adequate idea.

On discharging the battery through eight inches of tin wire $\frac{1}{8}$ th of an inch diameter, extended over a sheet of paper, a thick cloud of blue smoke arose, in which many calcareous filaments were discernible; at the same time a great number of red hot globules of tin, falling upon the paper, were repeatedly thrown up again into the air, and continued thus to rebound from its surface for several seconds. The paper was marked with a yellowish clouded stain immediately under the wire, and with streaks or rays of the same colour issuing from it in every direction: some of these formed an uninterrupted line, others were made up of separate spots. In order to be certain that the colour of these streaks was not caused by the paper being scorched, the experiment was several times repeated, when a plate of glass and a board covered with tin were placed to receive the globules. These, however, were stained exactly like the paper. On calcining five inches of the same kind of wire, the red-hot globules were thrown obliquely to the height of four feet, which afforded an opportunity of observing that each globule, in its course, diffused a matter like smoke, which continued to appear for a little while in the parabolic line described by its flight, forming a track in the air of about half an inch in breadth.

From this phenomenon, Dr Van Marum conjectures, that when the globules approach the paper on which they fall, the matter issuing from their lower part strikes against its surface, and being elastic, forces them upwards again by its reaction. The clouded stain immediately under the wire, the Doctor attributes to the instantaneous calcination of its surface; whereas the remainder of the metal is melted into globules, which, while they retain their glowing heat, continue to be superficially calcined, and, during the process, part with this calcareous vapour.

Phenomena something similar to the above were observed on the calcination of a wire of equal parts of tin and lead, eight inches long, and $\frac{1}{8}$ th of an inch in diameter. This also was melted into red globules, which were repeatedly driven upwards again from the paper on which they fell, and marked it with streaks of the same kind, but of a brown colour, edged with a yellow tinge. Some of these globules, though apparently not less hot, moved with less velocity than others, and were soon stopped in their course by their burning a hole in the paper. In this case, a yellow matter was seen to rise from their surface to the height of one or two lines, which extended itself to the width of a quarter of an inch. This matter continued, during

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Curious phenomena with tin-wire

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Accounted for.

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With wire composed of equal parts of tin and lead.

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five or six seconds, to issue from the globules, and formed, on their surface, a kind of efflorescence, resembling the flowers of sulphur produced by the *solfaterra*. The globules, from which these calcareous flowers had issued, were found to be entirely hollow, and to consist of only a thin shell. When this mixed metal is calcined with a less charge of the battery, it leaves a stain upon the paper, something similar to that made by lead, and does not run into globules.

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Stain upon paper by the calcination of metals.

The Doctor has also given plates of the stains made upon paper, by the calcination of iron, copper, brass, silver, and gold. Those made by copper and brass wires are remarkably beautiful, and are variegated with yellow, green, and a very bright brown. Eight inches of gold-wire, $\frac{1}{8}$ th of an inch in diameter, were, by the explosion, reduced to a purple substance, of which a part rose like a thick smoke, and the remainder, falling on the paper, left a stain diversified with different shades of this colour. Gold, silver, and copper, cannot easily be melted into globules. Our author has once accidentally succeeded in this; but it required a degree of electrical force so very particular, that the medium between a charge, which only broke the wire into pieces, and one which entirely calcined it, could not be ascertained by the electrometer.

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Effects upon metals confined in phlogisticated air.

Though Dr Van Marum was convinced, by M. Lavoisier's experiments, that metals, calcined in atmospheric air, absorb from it that principle which renders it fit for respiration; yet he resolved further to investigate this point, by trying what would be the effect of a discharge of the battery through a piece of wire confined in phlogisticated air. For this purpose, he took air, in which a burning coal had been extinguished, and which had afterwards stood eight days upon water, that it might be entirely cleared from fixed air; with this he filled a glass cylinder, four inches in diameter, and six inches high, closed at the upper end with a brass-plate; from the centre of this plate the wire was suspended, on which the experiment was made. The cylinder was set in a pewter dish filled with water; and, to prevent its being broken by the expansion of the air, its lower edges were supported by two pieces of wood half an inch high. The lower end of the wire rested on the dish, which was connected with the outside coating of the battery.

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In dephlogisticated air.

On transmitting the charge, in this manner, through wires of lead, tin, and iron, of only half the length of those which were calcined by an equal explosion in atmospheric air, no calcination took place. The first was reduced to a fine powder, which, upon trial by spirit of nitre, appeared to be merely lead; the two other metals were melted into small globules.

The Doctor then tried the same experiment in pure or dephlogisticated air, obtained from red precipitate; thinking that, in this, the metals would be more highly calcined than in common air. His expectation was answered only by the lead, which was entirely reduced to a yellow calx, perfectly resembling massicot. The other metals were not more highly calcined in this than in common air; but the globules of iron acquired so great a heat, as to retain it for some seconds, even in the water, and to melt holes in the pewter dish into which they fell.

In nitrous air, calcination took place as easily as in

common or in dephlogisticated air. This was contrary to Dr Van Marum's expectation; but he accounts for it, by observing that, from the experiments of Mr Cavendish and of M. Lavoisier, pure air appears to be one of the component parts of the nitrous acid.

In order to illustrate M. Lavoisier's theory, Dr Van Marum resolved to examine the phenomena resulting from the calcination of metals in water. This he tried with both iron and lead; and found that, in the moment of the explosion, a number of air-bubbles appeared on the surface, and the calx rose, like a cloud, through the water. This, he thinks, is not so easily accounted for by the theory of Stahl as by that of M. Lavoisier; because, according to the former, water does not readily either receive or part with phlogiston; whereas the latter supposes this fluid to be composed of the oxygenous principle, united with that of inflammable air. If this be true, nothing more is necessary to calcination, than that the metal should acquire a greater affinity with the oxygenous principle, that subsists between this and that of inflammable air, united with it in the composition of water. To collect the air generated by these calcinations was no easy matter; as the violence of the shock broke the glass receivers employed for this purpose: at last, however, the Doctor contrived a method of receiving it in a glazed stone basin. From the first calcination of lead, about a quarter of a cubic inch of air was produced, which showed no signs of inflammability; but, on every repetition of the experiment, a less quantity of air was generated; and on an accurate trial of that produced by the fourth calcination in the same water, it was found to consist of one part of inflammable and three of atmospheric air. Our author designs to repeat these experiments with water deprived of its air, by being boiled.

In order to imitate the phenomena of earthquakes, this ingenious philosopher followed Dr Priestley's method, and made the electrical explosion pass over a board, floating on water, on which several columns of wood were erected; but this succeeded only once. Reflecting that the electric explosion exerts the greatest lateral force when it passes through imperfect conductors, and that water is probably its principal subterraneous conductor, he laid two smooth boards upon each other, moistening the sides in contact with water; upon the uppermost, he placed pieces of wood, in imitation of buildings, the bases of which were 3 inches long and $1\frac{1}{4}$ broad. When the charge of the battery was transmitted between the boards, all these were thrown down by the tremulous and undulatory motion of that on which they stood.

Mr Brookes, electrician at Norwich, has made a great number of experiments, with a view to determine exactly the force of batteries of an inferior size in melting fine wires of different kinds. In these he was particularly careful to ascertain the degree to which his batteries were charged; and this he did by the method which shall afterwards be shown to be the best, viz. that of determining the power of the electricity by the weight which it was capable of raising by its repulsive power; and therefore, in the following experiments, the phrase of batteries being charged to so many grains, implies that the repulsive power of the knob of the battery was able to raise that weight.

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Some

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Phenomena from the calcination of metals in water.

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Phenomena of earthquakes imitated.

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Brookes's experiments on the force of batteries.

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Some of the most remarkable of these experiments were as follow:

" 1. With a battery of nine bottles, containing about 16 square feet of coated surface, charged to 32 grains of repulsion, which charge was sent through a piece of steel wire 12 inches long and $\frac{1}{100}$ th of an inch thick 11 times; the wire was shortened one inch and a half, being then about 10 inches and an half long; the 12th time, the wire was melted to pieces.

" 2. A charge, with the same nine bottles, to 32 grains of repulsion, being sent through a piece of steel wire 12 inches long and $\frac{1}{100}$ th of an inch thick, the first time melted the whole of it into small globules.

" 3. A charge of the same nine bottles charged to 32 grains, being sent through a piece of *brass* wire 12 inches long, $\frac{1}{100}$ th of an inch thick, the whole of it was melted, with much smoke, almost like gunpowder; but the metallic part of it, after it was melted, formed itself, in cooling, chiefly into concave hemispherical figures of various sizes.

" 4. With only eight of the above bottles charged to 32 grains, the charge did but just melt 12 inches of the steel wire, $\frac{1}{100}$ th of an inch thick, so as to fall into several pieces; which pieces in cooling formed themselves into oblong lumps joining to each other by a very small part of the wire between each lump, which was not melted enough to separate, but appeared like oblong beads on a thread at different distances.

" 5. The same eight bottles charged to 32 grains, so perfectly heated 12 inches of brass wire, about $\frac{1}{100}$ th of an inch thick, as to melt it, or soften it enough for it to fall down by its own weight (from the forceps with which it was held at each end) upon a sheet of paper placed under to catch it; and when it fell down, it was so perfectly flexible, that by falling, it formed itself into a bent, or rather vermicular shape, and remained entire its whole length. *i. e.* about 12 inches when it was put into the forceps; but after it was fallen on the paper, it sagged so much as to be stretched by its own weight from 12 to about 15 inches long; and by falling on the paper it flattened itself the whole length of it, so that when it was examined with an half inch magnifier, it appeared about five or six times broader than it was in thickness.

" 6. With nine bottles again, charged only to 20 grains, the charge was sent through 12 inches of steel wire $\frac{1}{100}$ th of an inch thick, which heated it enough to melt it so as to be separated in many places; and the pieces formed themselves into string-bead-like shapes, as in experiment 4.

" 7. With the same nine bottles charged to 20 grains, the charge was sent through 10 inches of brass wire $\frac{1}{100}$ th of an inch thick; the wire was heated so red hot as to be very flexible, yet it did not separate, but was shortened near $\frac{1}{4}$ ths of an inch.

" 8. A charge of nine bottles, charged to 20 grains, sent a second time through the last piece of wire, melted it asunder in three places.

" 9. Nine bottles charged to 30 grains, and the charge sent through 12 inches of brass wire $\frac{1}{100}$ th of an inch thick, treated it nearly as in experiment 5. except that it was separated in two places, and

the pieces measured about 16 inches and an half long; but perfectly flattened by its fall on the paper, as before.

" 10. Nine bottles charged to 30 grains, and the charge being sent through eight inches and a half of brass wire the size of the last, wholly dispersed it in smoke, and left nothing remaining to fall on the sheet of paper placed under it.

" 11. With 12 bottles, charged to 20 grains, the charge was sent through ten inches of steel wire one-hundredth of an inch thick, which made the wire red hot, but did not melt it.

" 12. A second charge, the same as the last, was sent through the same piece of wire, which heated it red hot as the first did, but it was not separated; this piece of wire was now shortened five-sixteenths of an inch.

" 13. A charge to 25 grains, with the same 12 bottles, was sent through the last piece of wire, which melted it into many pieces, and many globules of calcined metal.

" 14. A charge of 15 bottles, charged to 25 grains, was sent through ten inches of steel wire one-hundredth of an inch thick, which melted it the first time, and dispersed a great part of it about the room.

" 15. A charge with the last 15 bottles, charged to 20 grains, just melted ten inches of steel wire the size of the former, so as to run into beautiful globules, nearly as in exp. 13.

" 16. A charge of 15 bottles, charged to 15 grains, being sent through ten inches of steel wire the size of the last, it was barely made red hot; but it was shortened one-tenth of an inch by the stroke passing through it.

" 17. The last piece of wire having a charge of 15 bottles, charged to twelve and a half grains, sent thro' it, was not made red hot.

" 18. A charge of the same 15 bottles, charged to 25 grains, was sent through the same piece of wire, which seemingly tore the wire into splinters.

" 19. Four bottles, charged to 30 grains, just melted three inches of steel wire one hundred and seventieth of an inch thick, so as to fall into pieces.

" 20. Five bottles, charged to 25 grains, most beautifully melted three inches of such wire as the last into large globules.

" 21. Eight bottles, charged to 15 grains, melted three inches of steel wire one hundred and seventieth of an inch thick, similar to the five in the last experiment; so nearly alike both in appearance and effect, that it might have been said to be the same.

" 22. Ten bottles charged to twelve and a half grains, rather exceeded exp. 19. but scarcely came up to exp. 20. and 21.

" 23. Suspecting something in exp. 19. I found, that though my bottles hitherto were as nearly of the same size as I could procure them, yet some of them were a little larger than others, and, which was the case in exp. 19. one of the four was smaller than the other three; so that I repeated the experiment with four bottles more equal in size, and charged them to 30 grains, and the fusion was as perfect as in any.

" 24. A charge to 20 grains, with the last eight bottles, very finely melted six inches of steel wire one hundred and seventieth of an inch thick.

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" 25. With two bottles, charged to 45 grains, the charge was sent through one inch of such sized steel wire as the last, which only changed its colour.

" 26. Three bottles, with a 40 grains charge, dispersed one inch and a half of steel wire, the size of the last, all about the room.

" 27. As a steel wire of one-hundredth of an inch thick has nearly double the quantity of metal of a wire one hundred and seventieth of an inch thick, so I took three inches of the former, and sent a 25 grains charge with ten bottles through it, which melted it just as the five bottles did in exp. 20.

" 28. Twenty bottles, charged to twelve grains and a half, melted three inches of steel wire, the size of the last, exactly similar to the foregoing experiment.

" 29. As a steel wire of one-eightieth of an inch thick contains nearly twice the quantity of metal in the same length as a steel wire of one-hundredth, or four times the quantity of a steel wire of one hundred and seventieth of an inch thick; so it might, from the foregoing experiments, be expected that 20 bottles, charged to 25 grains, would melt three inches of steel wire one-eightieth of an inch thick; but on a great many trials 20 bottles could not be procured that would bear the discharge, when charged to 25 grains: for at the discharge there would be always one or more bottles broken or perforated. I was now reduced to the necessity of being content with getting bottles of any size that would bear the required charge, from one to three gallons each, or that contained from about 150 to 300, or more, square inches of coated surface, each; but all in vain, my only resource left (as I was not near any glass-house), was to increase the quantity of surface, and not to charge so high, and to proportion the one to the other: a third part was concluded on to be tried; that is, instead of about 36 feet of coating, I added one third, or 12 feet, which made it 48 feet: and that, instead of charging to 25 grains, or 24 grains, which divides by 3 better, to omit one-third of the height of the charge, which leaves 16 grains: and thus I succeeded perfectly well; for 3 inches of steel wire one-eightieth of an inch thick was as curiously melted with 48 feet of coated surface, charged to 16 grains, as any of the former.

" These bottles, thus broken in large discharges, seem always to break, or to be struck through, nearly in the thinnest, but never in the thickest place, which shows the necessity of the substance in the glass.

30. " As in exp. 19, and 21. where the former is but half the quantity of coated surface of the latter, charged to 30, and the latter to 15 grains, to know how high 48 feet of coating must be charged to produce the same effect exactly: and as the quantity of coating in four bottles, consisting of a little more than six feet and a half, is contained in 48 feet a little more than seven times; so I tried by charging 48 feet only to a little more than four grains, or only about one seventh part so high, as four times seven is 28; that is, but two less than 30; and this had exactly the same effect on the wire, which was one hundred and seventieth of an inch thick, and three inches long, as the former.

31. " As the last experiment agreed so exactly with exp. 19. and 20. the next thing tried was to see the ef-

fect of 48 feet of coated surface charged to a little more than four grains, upon six inches of steel wire, the size of the last; but this was only made very faintly red.

32. " A repetition of the last experiment with the same length of the same wire, to see how often the same charge might be sent through before it would be melted, and to observe the appearance of the wire after each stroke; the eighth stroke melted it into several pieces. After the first stroke, the redness grew less every time, even the last time, when it was separated. The first stroke, though little more than fairly red, made it so flexible, that by a little more than its own weight (about a penny-weight more), it was apparently made perfectly straight when it was cooled: about the third or fourth stroke it began to appear zig-zagged; after the sixth stroke the surface of it appeared rough; after the seventh stroke the surface was very roughly scorified or scaly; and some of the scales had fallen upon a piece of white paper, placed under it, at about half an inch distance below it. The eighth stroke melted it in three places; and at those places where the angles appeared the sharpest or most acute, a great number of the scaly appearances were driven off about the paper, which appeared like splinters (see exp. 18.); some of them were almost one-tenth of an inch long, and some of them about a third or a fourth part of the diameter of the wire in breadth, and very thin: after the seventh stroke it was shortened seven-sixteenths of an inch: the wire was one hundred and seventieth of an inch thick.

" 33. Repeating exp. 31. again with the same size and length of wire, and the same battery charged the same, in order to observe the method of the wire shortening, having fixed an insulated gage parallel to and about a quarter of an inch distant from it: after the first stroke, which made the wire fairly red, (it being fixed at one end, that the shortening might appear all at the other, which was held so as either to contract or dilate), I observed that it shortened considerably as it cooled; repeating the stroke, it did the same, and so on till it was melted, which was by the eighth stroke, as before. At the instant that the stroke passed thro' the wire it appeared to dilate a little, and after it was at its hottest, it gradually contracted after every stroke as it cooled, about one-sixteenth of an inch each time; the dilating was so very little, as to bear but a very small proportion to its contraction, and sometimes it was doubtful whether or not it did dilate at all; but after all the observations it appeared oftener as if it did dilate, than as if it did not.

34. " The same 48 feet, negatively charged to a little more than four grains, melted three inches of steel wire one hundred and seventieth of an inch thick, the same as the positive charge did in exp. 30.

" 35. The same battery of 48 feet of coated surface, charged to a little more than eight grains, melted three inches of steel wire one-hundredth of an inch thick. This is very nearly in proportion to exp. 27. but here the charge was negative, and the fusion was the most pleasing of any I have hitherto had; probably owing to the charge, by chance, happening to be so well adjusted as to be exactly sufficient to melt the wire and no more: it held hot the longest, and the fused metal ran into the largest globules: probably the

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length of the time that the heat continued, was owing to the charge being just sufficient, and to the size of the lumps that the fused metal formed itself into.

" 36. A repetition of exp. 1. with twelve inches of steel wire, one-hundredth of an inch thick, but with this difference, that as then I used only nine bottles, containing about 16 square feet of coated surface charged to 32 grains, I here used 18 bottles containing about 32 square feet of coating charged to only 16 grains. This was done, to observe the progress of the destruction of the wire, as in exp. 32, as well as to prove the similarity of the effect. The wire being the same size, sort of metal, and length, as recited just above; the first stroke made it fairly red-hot the whole length of it with smoke and smell, changed its colour to a kind of copperish hue, and shortened it considerably; the second stroke made it of a fine blue, but it did not appear red, and shortened it more; at the third stroke, it became zigzagged, many radii were very visible at the bendings, and continued to shorten till the eleventh stroke, when one of the bottles in the second row of the battery was struck through: the fracture was covered over with common cement, its place supplied by changing place with one in the third row, supposing the mended one to be the weakest; and thus, with the battery in this state, I made the twelfth stroke, which separated the wire, as in exp. 1. but this wire was shortened only one inch.

" 37. A charge of 48 feet to eight grains, sent through three inches of copper wire one hundred and seventieth of an inch thick, seven times, made it zigzagged, but not much shorter; the eighth stroke separated it at one end, close to the forceps which held it, but it did not appear to be made sensibly red-hot at all, notwithstanding it must have been often so at the place where it was melted: which space was so very small as barely to be perceptible, like as when a point is set upon any flat surface of iron, and a stroke from a pound phial being sent through, both the point and the flat surface where the point rested, if examined with a magnifying glass, will be found to have been melted, and a speck may be seen; but the redness of the metal will scarcely be visible.

" 38. A charge of 48 feet, to 16 grains, was sent through six inches of lead wire one-fiftieth of an inch thick, which melted it into many pieces.

" 39. A charge of 48 feet, to 15 grains, was sent through six inches of wire like the last, which did not separate it, but made it smoke.

" 40. A charge like the last was sent through the last piece of wire a second time; which melted it into several pieces.

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Lead more easily destructible than any other metals.

" The law by which wires resist destruction, in proportion to the thickness of the wire, does not seem to be so equable, by much, in the lead as in the steel wire. For a charge of four grains, in exp. 34. melted three inches of lead wire one-sixty-sixth of an inch thick: but it took a charge of about three times that power to destroy three inches of lead wire one-fiftieth of an inch thick; which is about double the quantity of metal in the same length as in that of one-sixty-sixth of an inch thick. Thus it is easy to find, what different resistance a wire of any of the foregoing metals, of equal size and length, will make to the electrical stroke or to lightning.

" The length of the electric circuit, in which the different wires were placed, in the foregoing experiments, from the nearest part of the inside to the nearest part of the outside of the battery, exclusive of the length of the said wires, was about eight feet.

" Notwithstanding the easy destruction of the lead wire by the electrical stroke, it seems greatly to be doubted, whether any thunder strokes happen in any place whatever, strong enough to destroy a strip of lead four inches broad and of the thickness of about eight pounds to the foot. Whence it may be presumed, that such a strip of lead may be perfectly safe for conductors through buildings of any kind whatever: as it is not much subject to decay in any common exposure.

" 41. Two gentlemen coming in to see a piece of wire melted by electricity, I proceeded to show it them, by fixing 12 inches of steel wire one-hundred and seventieth of an inch thick, in the forceps, and then (supposing the electrometer and all other things ready placed) to charge the battery, but the electrometer did not move; nevertheless I continued charging as I supposed; but still the electrometer remained as it was, although I had been charging much longer than would have been necessary, contrary to my design, which was to take a small wire, that a small charge might be sufficient. Having been charging a long time, I left off to look about the apparatus, in order to see if any thing was not right: as I was looking, I found there was no communication to the electrometer, and heard a small crackling in the battery, which convinced me that it was charged. Accordingly I made the discharge, expecting nothing unusual; but the wire was dispersed seemingly in a very violent manner. The report was so very loud that our ears were stunned, and the flash of light so very great, that my sight was quite confused for a few seconds. The singularity of the appearances attending this experiment led me to insert it."

Though from what has been said under section VI. the direction of the electric fluid *outwards* from a body positively electrified, and *inwards* from one negatively so, seems to be sufficiently ascertained, yet some experiments related by Mr Nicholson in the last volume of the Philosophical Transactions, which seem to militate against this doctrine, require a particular consideration; and for this reason we shall here not only give an account of these, but of some others made on the subject of excitation, and the state of a charged phial in general, which seem to throw some light upon the subject. Mr Milner, who has been at great pains to inquire into this matter, makes the following observations:

" I. In the charged phial, when the inside has either kind of electricity communicated to it, the outside is found to possess a contrary power. It appears also from the preceding experiments, that either kind of electricity always produces the other on any conducting substance placed within the sphere of influence. And as the same effect is also produced on electrics themselves, in the same situation, and as some portion of the air, supposing no other substance to be near enough, must be unavoidably exposed to such influence, it necessarily follows, that neither power can exist without the other; and therefore, in every possible case,

positive

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161. Violent explosion from an electric battery.

162. Milner's account of the Leyden phial.

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positive and negative electricity are inseparably united.

" II. A phial cannot be fully charged, by which the outside acquires a contrary electricity, unless the external coating has a communication by some conductor with the earth. In the same manner, a full charge of the contrary electricity cannot readily be procured in these experiments without a similar communication.

" III. In both cases the interposition of an electric body between the contrary powers is absolutely necessary. In one case that body is glass, in the other it is air; and the experiment will not succeed in either, unless both the glass and the air be tolerably free from moisture.

" IV. It appears from the 18th experiment, that the influence of electricity acts in the same manner through glass as it does through the air, and produces a contrary power in both cases.

" V. A communication of the electric matter is more easily made through the fluid yielding substance of the air than through glass; which is so hard and solid a body, as to require a very considerable degree of power to separate its component particles: this, however, sometimes happens, and a hole is made through the glass itself, without design, in attempting to charge a very thin phial as high as possible, in the most favourable state of the atmosphere.

" VI. A conducting body receives the strongest charge of the contrary electricity, in these experiments when it is brought as near as possible to the electric power, without being within the communicating distance. And it is well known that the thinnest phial, if it be strong enough to prevent a communication between the two surfaces, will always receive the highest charge.

" VII. The electricity of the external surface of the charged phial cannot be destroyed, so long as the internal surface remains in force, and continues to exert its influence through the glass; because this influence was the cause of the contrary electricity on the external surface, and must therefore preserve it.

" VIII. If part of the course which the electric matter takes in discharging a phial be through the air, a small part of the charge will always remain; because the whole of the redundancy on one surface is not capable of forcing a passage through the resisting medium of the air, in order to supply the deficiency on the other surface. But if every part of the circuit, from the internal to the external coating, consists of the best conductors, and if the coated surfaces be nearly equal, and directly opposite to each other, the phial will then appear to have retained no part of the charge, so far as it is covered with tin-foil; but the parts of it above the coating on both sides will, however, still retain the contrary electricities, after the circuit has been com-

pleted (G). A residue of the charge may also be observed in every other instance of electrification, in which the degree of electricity is sufficient to force a communication between the electrified body and a conductor not insulated, through a small portion of the air: and if the experiment be carefully made, it will appear, that the whole of the redundancy is not capable of passing through the resisting intermediate air, in any case, and therefore a part of the charge must always remain. This may be conveniently shown by using a well excited electrophorus of about five inches diameter, the metal cover of which may be so strongly electrified, as to force a communication through the air, to any good conductor not insulated, at the distance of three quarters of an inch. After this, a second communication much weaker than the first may be made at the distance of about the twelfth-part of an inch, which is the residue of the charge, or rather a part of it: for if the second communication be carefully made through the air, without touching the cover, it will be found still to have retained enough of the first charge to electrify a pair of vertical needles.

" As it appears from this view, that both these cases are similar in so many remarkable particulars, it follows, that they are essentially the same, notwithstanding they differ in the degree of power and some other circumstances, which may alter the form of an experiment without changing its nature. It is apprehended, therefore, that the above mentioned distinction will not only appear to be unnecessary, but also that either power cannot possibly exist without the other, as it has been shown under the first particular, that positive and negative electricity were inseparably united. But here it will be proper to examine more particularly the nature of charged glass.

" 1. When a plate of coated glass has been charged, and the circuit between the coatings has been completed, by the mediation of a good conducting substance, no part of the coated surface is supposed to retain any part of the charge; but, according to the commonly received doctrine, the whole of it is said to be discharged; or in other words, to be brought into its natural state. This, however, is not really the case, as will evidently appear from the following experiment; the design of which is to show the effects produced by charging and discharging a plate of glass.

" 2. Let the middle of a piece of crown window-glass, seven inches square, be placed between two circular plates of brass, about the 16th part of an inch thick, and five inches in diameter. In order to enable these plates to retain a greater degree of power, it will be proper to terminate each of them with a round bead the third part of an inch thick; and the whole of the bead should be formed on one side of the plate, that the other side may remain quite flat, and apply well to the surface of the glass. Let the whole be insulated

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" (G) The whole remainder of the charged phial must not, however, be ascribed to the cause above mentioned: for after taking away that part of it belonging to the coated surface, which could not force a passage through the air, if the phial be allowed to stand a short time on the table, the coated surface will again gradually acquire some power, which must be derived from the charge of the phial above the coating. Another source of the residuum will appear in the next experiment."

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lated about four inches above the table, and in an horizontal position, by fastening one end of a cylindrical piece of some good insulating substance to the middle of the under plate, the other end of it being fixed in any convenient stand. Let a like insulating stem be fastened to the middle of the upper plate. Let a brass chain, which may easily be removed, reach from the under plate to the table. In the last place, bend a piece of brass wire into such a shape that it may stand perpendicularly on the upper plate; and let the upper extremity of this wire be formed into an hook, that it may be removed at any time by the assistance of a silk string, without destroying the insulation of the plate.

"3. The glass being thus coated with metal on both sides, and having also a proper communication with the table, will admit of being charged; and both coatings may be separated from the glass, and examined apart, without destroying the insulation of either: for the upper coating may be separated by the means of its own proper stem; and the under coating may be separated by taking hold of the corners of the glass, and lifting the glass itself. As glass readily attracts moisture from the atmosphere, it will therefore be necessary to warm it in the beginning, and to repeat it several times in the course of the experiment, unless the air should be very dry.

"4. Excite a smooth glass tube, of the common size, by rubbing it with silk, and apply it repeatedly to the bent wire until the glass be well charged. Then remove the chain, which reaches from the lower plate to the table, and also the charging wire from the upper plate, by laying hold of its hook with a silk string. It necessarily follows, from considering the quality of the power employed in the present case, that the upper surface of the glass, together with the upper coating, must be electrified positively; and that the under surface and coating must be electrified negatively: but as it is designed in this experiment to examine the powers of charged glass, that no virtue may be imputed to the glass but what really belongs to it, let both coatings be separated from it; and after they have been brought to their natural state, by touching them with a conducting body not insulated, let the glass be replaced between them; and whatever effects may now be produced, must be ascribed solely to the powers of the charged glass. On bringing a finger near the upper coating, a small electrical spark will appear between that coating and the finger, attended with a snapping noise. Apply a finger in the same manner to the under coating, and the same thing will happen. This effect cannot be produced twice, by two succeeding applications to the same coating; but it may be repeated several hundred times over, in a favourable state of the atmosphere, by alternate applications to the two coatings; and the powers of the glass will be thus gradually weakened.

"5. This part of the experiment may be explained, by observing, that the contrary electricities have a natural tendency to produce, and to preserve each other, on the opposite sides of a plate of glass; and therefore, the increase or decrease of power, on either surface, must be regulated by the increase or decrease of the contrary power on the other side: and as in charging a plate of glass positively, no gradual addition of elec-

tric matter can be made to the upper surface, without a proper conveyance for a proportionable part to pass away from the lower surface; so in this method of uncharging it, the electric matter cannot be gradually taken away from the upper surface, without adding a proportionable part to the under surface: one operation is the reverse of the other, and so are the effects; one case being attended with an increase and the other with a decrease of power.

"6. Let the glass be again fully charged, and after bringing both coatings to their natural state as before, let the glass be replaced between them; and on touching the upper coating with a finger, and then separating it from the upper and positive surface of the glass by the insulating stem, this coating will acquire a weak negative power, which will be sufficient to produce a small spark while the glass is in full force, though after the power of the glass has been reduced, it will give little or no spark: but, in both cases, on touching the coatings alternately two or three times, the negative power of this coating, when separated from the positive surface of the glass, will be so considerably increased, as to produce strong negative sparks.—This effect may now be repeated several times, by only touching the upper coating, but the sparks will grow weaker every time; and they may be restored again to nearly their former strength, by alternate applications to both coatings, as before. The same things will also happen to the under coating, in the same circumstances; but with this difference, that the power of the under coating, on being separated from the under and negative surface of the glass, will be positive. And thus a long succession of both positive and negative sparks may be produced in favourable weather; or at any time by keeping the glass moderately warm.

"7. It appears from this part of the experiment, that each of the surfaces of the charged glass has a power of producing a contrary electricity in the coating in contact with it, by a momentary interruption of the insulation. It necessarily follows in producing these effects, that more electrical matter must have passed away from the upper coating, at the time of touching it, than the same coating could receive from the upper surface of the glass; and therefore, the upper coating, by losing some of its natural quantity, will be negatively electrified: and also, that more electric matter must have been added to the under coating at the time of touching it, than the under surface of the glass could receive from it; and therefore the under coating, by receiving some addition to its natural quantity, will be positively electrified. It appears further, that the greatest degree of this influential power, which may be consistent with the circumstances of the case, will be produced in either coating, by taking care at the same time to bring the opposite coating into a like state of influential electricity: and thus it is evident, that the influential powers of the two coatings have the same relation to each other as the contrary powers of the glass itself, and will therefore always increase or decrease together.

"8. The glass being again well charged as at first, let a brass wire bent in the form of a staple be brought into contact with the upper and lower coating at the same time. By this the common discharge will be made: but the equilibrium of the coated glass will be only

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only restored in part; for a considerable degree of attraction will happen at the same time between the upper coating and the glass, which has frequently been strong enough to lift a piece of plate-glass weighing ten ounces (H). Neither coating will now show the least external sign of electricity while it is in contact with the glass; but on separating either of them from it, if care be taken to preserve their insulations, the upper coating will be strongly electrified negatively, and the under coating will be strongly electrified positively. Let then both coatings be brought to their natural state, by touching them when separated from the glass, with a conducting body not insulated, and let the glass be replaced between them as before. In this state of things, on touching the upper coating only, and separating it from the glass, it will not be capable of giving any spark; but on touching the coatings alternately five or six times, it will then give a weak spark; and this may now be repeated several times by only touching the upper coating: but on a second application of the bent wire to both coatings at the same time, a second discharge may be perceived, though much weaker than the first, and the coatings will be again brought into the same electrical state as immediately after the first discharge. This may frequently be repeated; and a considerable number of strong negative sparks may be taken from the coating when it is separated from the positive surface of the glass. If the glass in replacing it between the two plates be turned upside down, the electrical powers of both coatings will be changed by the next application of the discharging wire to complete the circuit; and a succession of strong positive sparks may be taken from the coating when it is separated from the negative surface of the glass.

"9. It appears from this part of the experiment, that the coated part of the charged glass was not brought into its natural state by completing the circuit between the coatings; but that it still retained a degree of permanent electricity; that the powers of both coatings were actually changed at the time of the first discharge; and that a succession of the same powers may be produced in the coatings, without renewing the least application of electricity to the glass itself.

"10. The whole quantity of electric matter added to the glass in charging it, is evidently distinguished into two parts in this experiment. The first part, which is by far the most considerable, appears to have been readily communicated from one surface of the glass to the other, along the bent wire, when it was first brought into contact with both coatings at the same time. The second part of the charge appears to be more permanent, and remains still united with the glass, notwithstanding the circuit has been completed (1). This

permanent electricity, as well as the other, must be positive on the upper surface, and negative on the lower surface; because, in the present experiment, the charge was given by a smooth glass tube excited with a silk rubber. Now, the influence of the opposite and permanent powers on the different sides of the glass (each side having a tendency to bring the coating in contact with it into a state of electricity contrary to its own) must assist each other, in causing part of the electric matter naturally belonging to the upper coating to pass away from it to the under coating, along the discharging wire, and at the same time the surcharge to pass the same way. The upper coating, therefore, by losing some part of its natural quantity, must be negatively electrified; and the under coating, by receiving an addition to its natural quantity, must be positively electrified. The whole quantity of electric matter, which the influence of the permanent electricity of the glass is capable of taking from one coating and of adding to the other, bears but a small proportion to the whole charge; and therefore the second and every subsequent discharge must be considerably weaker than the first.

"11. It appears from several of the preceding experiments, that a considerable degree of influential power may be produced at some distance by an electric in full force; and therefore a small excited body of a cylindrical shape was sufficient to answer that purpose: but when the excited electric has been so far weakened that it cannot communicate its own power, nor produce this influential power in any body, unless it be brought very near or in contact with it, bodies of a cylindrical form must then act to great disadvantage, and a small degree of power only can be produced; because the strength of the influential electricity in this case will be in proportion to the surfaces of the electric and conducting bodies, which are brought near together, or in contact with each other; and therefore a plate of glass in the same circumstances, whether its permanent power be derived from excitation or communication, is enabled from its shape to produce a considerable degree of the influential powers in the coatings in contact with it.

"12. It appears from this experiment, that the ingenious professor Volta's electrophorus is, in reality, a resinous plate charged with permanent electricity by friction: and because there is a less disposition in a body of this kind to attract moisture from the atmosphere than there is in glass; it will retain the power better, and consequently be the longer capable of producing a contrary electricity in the insulated metal cover. If it should be thought necessary to support this observation by a direct experiment, it may easily be done by making a thin flat plate of any resinous electric substance, and larger than the insulated cover, but without fastening

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Hypothesis concerning the electrophorus.

"(H) The whole of this effect must not be ascribed to the attraction of electricity. Perhaps the passage of electric matter between the coating and the glass may help to exclude the air; and then the attraction of cohesion, and the pressure of the external air both above and below, may be supposed to have the most considerable share in producing this effect.

"(1) Some new terms seem to be wanted in order to express with precision the different parts of the charge. And if that part of it which cannot be destroyed by completing the circuit, should be called *the permanent part of the charge*, or more simply *the charge*; then might the other part, or that which may be destroyed by completing the circuit, be named *the surcharge*.

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a coating to either surface; and then, whether this plate be charged by excitation or communication, one of its sides will be positive and the other side negative; and a succession of positive sparks may be produced on the negative side, and of negative sparks on the positive side, by a proper application of the insulated metal cover. It will be also found, that this resinous plate cannot be well charged, either by excitation or communication, unless a coating of some conducting matter should be kept in contact with the under surface; and it should also have some communication with the floor.

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How to charge a phial without friction.

"13. It has been very properly recommended to use a particular kind of rubber, and to attend to the state of it, in order to excite glass well; but it will not be necessary to pay the least regard to these circumstances in the following experiments, in which a method will be shown of charging a small phial and a plate of glass at the same time, by a gradual accumulation of power; that power being entirely derived from the glass itself, and with no other degree or kind of friction than is necessarily connected with the form of the experiment.

"14. Place a circle of tin-foil five inches in diameter on the table, between a soft piece of baize and the middle of the same plate of glass that was used in the last experiment, which will thus be coated on the under side; and in order to preserve a proper communication with this coating, let a fillet of tin-foil reach from it beyond the extremity of the glass. The same insulated metal cover is to be used for the upper coating as before. Let a thin ounce-phial of glass be filled with brass filings, and coated with tin-foil on the outside to about one inch from the top. Let a large brass wire, the fifth part of an inch in diameter, pass through the cork of the phial into the filings, about an inch of it being left above the cork, and let the upper extremity of this wire be well rounded. This experiment requires, that the whole construction should be well warmed at first; and it will be necessary to repeat it at proper intervals, unless the atmosphere should be very dry.

"15. Taking hold of the wire of the phial with one hand, let it be placed on the upper surface of the glass, and its bottom carried in contact over the middle of the upper surface, as far as the tin-foil coating reaches on the under side: and during this part of the operation, a finger of the other hand must be kept in contact with the fillet of tin-foil. Then lifting the phial by the wire with one hand, let it be placed on the insulated metal cover, suspended in the air with the other hand; and after shifting the hand from the wire to the coating, let the bottom of the phial be placed on the end of the tin-foil fillet. Place the insulated metal cover on the middle of the glass, and touch it with a finger of one hand, while the other hand touches the tin-foil fillet. Now lift the insulated cover by its stem, and bring the head of the cover in contact with the wire of the phial, and a very small spark of light will appear between them. Let this be repeated in the same manner about 15 times, taking care to preserve a proper communication between the coating and the floor. Then taking hold of the phial by the coating, let it be replaced on the insulated cover while it is suspended in the air; and after shifting the hand from the coating to the wire, let it be

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again placed on the middle of the glass, and let the bottom be again carried in contact over the middle of the glass, holding the wire in one hand, while the other has a proper communication with the tin-foil coating. Let the phial be again returned to the tin-foil fillet as before, and let the insulated cover be applied repeatedly to the wire, immediately after every separation from the glass; and a brighter spark, together with a weak snapping, will now attend each application, if it be carefully observed to touch the cover with one hand before every separation, while the other hand rests on the fillet of tin-foil. By proceeding in this manner, after the third application of the phial to the glass, a very weak shock will be felt in those fingers which are used in completing the circuit of the glass; and after repeating two rounds more in the manner before mentioned, the phial will be fully charged. By applying the coating of the phial when it is in full force to the upper surface as before, the glass plate will get the greatest power it is thus capable of receiving, and will then give a shock as high as the elbows. After this, on attempting to lift the insulated cover, the glass itself will generally be lifted at the same time, with the tin-foil coating adhering to the under surface: but by continuing the separations of the cover from the glass, a succession of strong negative sparks may be produced by the influence of the upper surface; and by turning the glass over, and leaving the tin-foil coating on the baize, a succession of strong positive sparks may be produced by the influence of the other side.

"16. This experiment may be performed more steadily by placing the glass, together with the tin-foil coating and baize, on a plate of metal about $\frac{1}{10}$ th of an inch thick, and of the same square as the glass. The whole may be fastened together by two small holdfasts placed at the opposite corners, which will prevent the glass from being lifted. This plate of metal will be useful in another view; for after it has been sufficiently warmed, by retaining heat well, it will help to keep the glass dry, and consequently fit for use so much the longer. But when it shall be required to show the contrary powers of the opposite sides of the glass, it will be more convenient not to fasten the parts together, and the whole may be kept sufficiently steady, by the operator's keeping down one corner of the glass with a finger, and by placing a proper weight on the opposite corner.

"17. The bottom of the phial cannot be carried in contact over the glass without producing some little degree of friction; from which the power in this experiment is originally derived. The cover will appear on examination to be electrified negatively after every separation from the glass: but as it was touched in completing the circuit between the coatings before every separation, it necessarily follows, that the cover can have only an influential electricity, and consequently that the permanent power of the upper surface of the glass must be positive. The negative power of the cover is communicated to the wire of the phial, by which the inside is electrified negatively and the outside positively; and both these powers will increase with every application, because the circumstances of the phial are favourable to its charging. The phial must be insulated every time it is required to shift the hand from the wire to the coating, or from the coating to the wire;

for

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for without this precaution the phial would be discharged. By applying the outside of the phial to the upper surface of the glass, in the manner above mentioned, the phial will be partly discharged on that surface: and though it must be therefore weakened, the power of the glass will be increased, and consequently enabled to produce a proportionably stronger effect on the brass cover, which by the next round of applications will give the phial a stronger charge than it had before. And thus a very small degree of original power is first generated, and then employed in forming two different accumulations: and by making each of these subservient to the increase of the other, the phial is at last fully charged, and the glass plate acquires such a degree of the surcharge, as to give a pretty smart shock; and after that, it remains capable, by the influence of its permanent powers, of producing a succession of positive and negative sparks on the opposite surfaces.

"18. The contrary charge may be given to the phial by taking hold of the coating, and carrying the wire in contact over the middle of the upper surface of the glass, and by applying the power of the insulated cover to the coating; for if the operation be conducted in every other respect in the same manner as before, then will the inside be electrified positively, and the outside negatively. The powers of the glass plate will be the same as they were in the former case.

"19. After the phial has been fully charged negatively, by the process of the last experiment, let it be insulated; and taking hold of the wire, let the bottom be held uppermost, and let the hand which holds it rest on the fillet of tin-foil. Apply the insulated cover to the glass, and after touching it with a finger of the other hand, separate it from the glass; and on bringing it towards the coating of the phial, a strong spark will pass between them. After repeating this between 20 and 30 times, the powers of the phial will be destroyed; and by continuing the same operation, they will be inverted; for the inside will be at last fully charged positively, and the outside negatively.

"20. The same effect may be produced, by turning the glass over, and by repeatedly applying the influential electricity, produced on that side, to the wire of the phial.

"21. When the phial has been fully charged negatively, as in the last experiment, take hold of the coating of the phial with one hand, and while the other hand rests on the tin-foil fillet, apply the wire to the middle of the upper surface of the glass, as far as the tin-foil coating extends on the other side. By this the powers of the glass plate will be changed.

"22. Another, and perhaps a better method of applying the phial, is to place the insulated cover on the surface of the glass, and then holding the phial by the coating in one hand, to apply the wire to the cover, while the other hand touches the fillet of tin-foil; by which a shock will be given, and the same change of powers will be produced in an instant, which before took up some little time. On lifting the insulated cover by its stem immediately after the shock, it will be negative, or have the same power as the inside of the phial; but on replacing the cover, and completing the circuit of the glass plate, the surcharge will be destroyed; another shock will be felt; and the power of the cover, after the next separation, will be positive, or contrary to that of the inside of

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the phial. Apply this positive power to the wire of the phial as before; and after 15 applications, the powers of the phial will be destroyed: and by still proceeding in the same manner, the powers of the phial will be changed, and the inside will be fully charged positively and the outside negatively, by 60 applications.

"23. These effects may also be produced by a single application of the coating of the phial to the other side of the glass plate; and by repeated applications of the influential electricity, produced on the same side, to the coating of the phial.

"24. If it were simply the object in this experiment to change the powers of the phial, the operation might then be considerably shortened, by completing the circuit of the phial, and consequently destroying the whole surcharge: but it was intended to show what effects might be produced, by opposing the contrary powers to each other; and by doing this it appears that either side of the glass plate can destroy the powers of the phial, and give it a contrary charge; that either side of the phial can also change the powers of the glass plate; and that the powers of the glass plate, thus inverted, can again destroy the powers of the phial, and give it a full charge of the contrary electricity.

"25. Here it may be observed, that, in some cases, the quality of the power may be determined by observation alone. When the phial employed in the two last experiments has been fully charged, it may be known whether the inside be positive or negative from the light which appears at the wire, or from the hissing noise which attends it: for when the phial has been fully charged positively, if the room be sufficiently darkened, a bright luminous appearance may be seen, diverging in separate rays to the distance of an inch, attended with an interrupted hissing noise; and both the light and the noise continue a very short time. But when the phial is fully charged negatively, a weaker and more uniform light appears, which does not extend itself more than the sixth part of an inch, and is attended with a closer and more uniform hissing; and this noise and light always continue longer than the former. Even positive and negative sparks, passing between the insulated cover and a finger, may be distinguished from each other: for the positive sparks are more divided, give less light, make a weaker snapping noise, and affect the finger less sensibly than the negative.

"26. The strongest sparks which can be produced in these experiments, are those that pass between the coating of the phial and the insulated cover, when they possess contrary powers; but they will be more particularly vigorous, if the coating be positive and the insulated cover negative."

In Sect. vi. of this treatise we have related some experiments, tending to show, that in the act of charging a phial with positive electricity, both became positive; and in the act of charging one negatively, both became negative. These were inserted in the former edition of this work; since which time Mr Brookes at Norwich has published a treatise; in which he not only adopts the opinion, but lays claim to it as his discovery, from some letters wrote in the year 1775. His experiments are extremely well adapted to elucidate the point intended; and the most remarkable of them are as follow:

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" 1. Let

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Mr Brookes's experiments on the Leyden-phial.

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“ 1. Let two pound phials be coated with tin-foil on their outsides, and filled to a convenient height with common shot, to serve as a coating within-side, as well as to keep a wire steady in the phials without a stopple in the mouth of them. Let each phial be furnished with a wire about the size of a goose-quill, and about ten inches long, and let each wire be sharpened a little at one end, that it may the more easily be thrust down into the shot, so as not to touch the glass any where at the mouth of the phials, yet so as to stand steadily in them. Let a metallic ball about six or seven eighths of an inch diameter be screwed on at the other end of each wire: also let there be in readiness a third wire, fitted up like those for the phials, except that another ball of nearly the same size as the former may occasionally be screwed on over the sharpened end of it. I say, instead of suspending the phials from the prime conductor as before, let one of those above described be charged at the prime conductor, and then set it aside, but let it be in readiness in its charged state: then let the other be placed upon a good insulating stand, and let the third wire also be laid upon the stand, so that its ball, or some part of the wire, may touch the coating of the phial. Let the sharpened end of this wire project five or six inches over the edge of the stand: all of these being now placed close to the edge of a table, hang a pair of cork balls on the sharpened end of the wire, and make a communication from the prime conductor to the ball on the wire on the bottle: on working the machine, the sharpened end of the wire will permit the bottle to be charged although it be insulated; and if the wire be very finely pointed, the bottle may be charged nearly as well as if it were not insulated: I say, on working the machine, the phial will charge, and the cork balls will immediately repel each other; but whilst this phial is charging, take the first phial, which having been previously charged at the same prime conductor in the hand, and while the second phial is charging, present the ball of the first to the cork balls, and they will all repel each other. This plainly proves that the outside of the second bottle is electrified plus at the time that it is charging, the same as the inside of the first; and the inside of both the bottles will readily be allowed to be charged alike, that is, plus or positive.

“ 2. Let the second bottle in the last experiment be wholly discharged, and charge it again as before (the first bottle yet remaining charged), and whilst it is charging, let the ball of the first approach the cork balls contiguous with the second, and they will, as before, all repel each other: withdraw the ball of the first, and so long as the machine continues to charge the second bottle higher, the cork balls will continue to repel each other; but cease working the machine, and the cork balls will cease to repel each other till they touch, and will then very soon repel each other again; then let the ball in the first phial approach the cork balls, and they will now be attracted by it, instead of being repelled as above, as in the last experiment. This also plainly shows, that both sides of a Leyden phial are alike at the time it is charging; and at the same time evidently shows, that the difference of the two sides does not take place till after the bottle is charged, or till the machine ceases to charge it higher.

“ 3. In this experiment, let both the former bottles be discharged, then let one of them be placed upon the insulating stand. Let a ball be put on over the sharpened end of the third wire, and let it be laid on the stand as before, so as to touch the coating of the phial: place the other phial on the table, so that its ball or wire may touch the ball on the third wire, or any part of the wire itself: make a communication from the ball on the wire of the first phial to the prime conductor: then, by working the machine, both bottles will soon become charged. As soon as they are pretty well charged, and before the machine cease working, remove the second phial from the third wire; after the second phial is removed, cease working the machine as soon as possible: take the third wire, with its two balls, off the stand with the hand, and lay it on the table, so that one of its balls may touch the outside coating of the second phial: remove the first phial off the stand, and place it on the table so as to touch the ball at the other end of the third wire; then, with an insulated discharging rod, make a communication from the ball in one bottle to the ball in the other: if the outside of the first phial be negative at the time it is charging, the inside of the second will be the same, and making the above communication would produce an explosion, and both bottles would be discharged; but the contrary will happen, for there will be no explosion, nor will either of the bottles be discharged, although there be a complete communication between their outsides, because the inside of them both will be positive. This is a proof, that considering one side of a phial to be positive and the other negative at the time they are charging, is a mistake: as well as that, if any number of bottles be suspended at the tail of each other, all the intermediate surfaces or sides do not continue so.

“ 4. Here also let the apparatus be disposed as in the last experiment, till the bottles are highly charged: then, with a clean stick of glass, or the like, remove the communication between the ball of the first phial and the prime conductor before the machine ceases working; then, with an insulated discharging rod, make a communication from the outside to the inside of the first phial; a strong explosion will take place on account of the excess within-side, notwithstanding they are both positive.

“ 5. This experiment being something of a continuation of the preceding one, immediately after the last explosion takes place, discharge the prime conductor of its electricity and atmosphere; then touch the ball in the first phial with the hand, or any conducting substance that is not insulated; then will the inside coating of the first phial, which at first was so strongly positive, be in the same state as the outside coating of the second, having a communication by the hand, the floor, &c. with each other; that is, negative, if any thing can properly be called negative or positive that has a communication with the common stock: but a pair of cork balls that are electrified either plus or minus, will no more be attracted by either the inside coating of the first phial or the outside coating of the second, than they will by the table on which they stand, or a common chair in the room, while they continue in that situation. Remove the aforesaid communication from the ball of the first phial;

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phial; touch the ball in the second, as before in the first, or discharge the bottle with the discharging rod, and the ball in the first bottle will immediately become negative: with a pair of cork balls, electrified negatively, approach the ball in the first phial, and they will all repel each other, or, if the cork balls be electrified positively, they will be attracted. All these circumstances together seem fully to prove what has already been said, not only that the inside of the first phial, which was so strongly positive, may be altered so as to become in the same state as the outside of the second, without discharging the phial, or any more working the machine; but that it may be fairly changed, from being positively charged to being negatively charged. If a pair of cork balls are now hanged on to the ball of the wire in this phial, by the help of a stick of glass, they will repel each other, being negatively electrified. Make a communication from the outside of the bottle to the table, and replace the communication from the prime conductor to the ball in the bottle; then, upon moderately working the machine to charge the bottle, the cork balls will cease to repel each other till they touch, and will soon repel each other again by being electrified positively. Here the working the machine anew, plainly shows that the inside of the first bottle, which was positive, was likewise changed to negative.

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His method of preserving jars in a battery from being broke by a discharge.

"In making electrical experiments, and in particular those in which the Leyden phial is concerned (a number of which together compose most electrical batteries), a method to preserve the bottles or jars from being struck through by the electric charge is very desirable; but I do not know that it has hitherto been accomplished. The number of them that have been destroyed in the foregoing, as well as in many experiments made long before, have led me to various conjectures to preserve them: at the same time I have been obliged to make use of bottles instead of open mouthed jars. And as coating the former within-side is very troublesome, it has put me on thinking of some method more easy, quicker, and equally firm and good, as with the tin-foil. With respect to the new method of coating, I failed; though something else presented itself rather in behalf of the former: therefore introducing the process here will not be of very great use; unless in saving another the trouble of making use of the same method, or giving a hint towards the former, so as to succeed with certainty. My aim was, to find something that should be quick and clean, and not easy to come off with the rubbing of wires against it, and yet a good conductor. My first essay was with a cement of pitch, rosin, and wax, melted together; into which, to make it a good conductor, I put a large proportion of finely sifted brass filings. When this mixture was cold, I put broken pieces of it into the bottle, and warmed the bottle till it was hot enough to melt the cement in it so as to run, and cover the bottle within-side; then I coated the outside with tin-foil as is commonly done, and now it was fit for use, or ready to be charged: to which I next proceeded; and I believe I had not made more than four or five turns of the winch before it spontaneously struck through the glass with a very small charge. I then took off the outside coating, and

stopped the fracture with some of my common cement, after which I put the coating on again; and, in as little time as before, it was struck through again in a different place: and thus I did with this bottle five or six times; sometimes it struck through the cement, but it struck through the glass in four different places. This made me consider what it might be that facilitated the spontaneous striking through the glass, and likewise what might retard it. I had long before thought that jars or bottles appeared to be struck through with a much less charge, just after their being coated, or before they were dry, than when they had been coated long enough for the moisture to be evaporated from the paste with which I mostly lay on the tin-foil; and could only consider the dry paste as a kind of mediator between the tin-foil and the glass, or, in other words, that the moisture in the paste was a better conductor, and more in actual contact with the glass, than the paste itself when dry. And the coating the bottles with the heated cement, though long afterward, did not alter my former idea; for it appeared as if the hot cement, with the conducting substance in it, might be still more in actual contact with the glass than the moisture in the paste. On these probabilities I had to consider what might act as a kind of mediator more effectually than the dry paste between the glass and the tin-foil. It occurred, that common writing-paper, as being neither a good conductor nor insulator, might be serviceable by being first pasted smoothly to the tin-foil and left to dry. The paper then being pasted on one side, having the tin-foil on the other, I put them on the glass together with the tin-foil outward, and rubbed them down smooth. This succeeded so well that I have never since had any struck through that were thus done, either common phials, or large bottles which contain near three gallons each, though some of the latter have stood in the battery in common use with the other a long time. And as I have never had one struck through that has been prepared in this way, I am much less able at present to tell how great a charge they will bear before they are struck through, or whether they will be struck through at all."

In the last part of the Philosophical Transactions for 1789, we have the following experiments by Mr Nicholson, on an improved method of excitation, as well as the action of points, and the direction of the fluid in positive and negative electricity.

"1. A glass cylinder was mounted, and a cushion applied with a silk flap, proceeding from the edge of the cushion over its surface, and thence half round the cylinder. The cylinder was then excited by applying an amalgamed leather in the usual manner. The electricity was received by a conductor, and passed off in sparks to Lane's electrometer. By the frequency of these sparks, or by the number of turns required to cause spontaneous explosion of a jar, the strength of the excitation was ascertained.

"2. The cushion was withdrawn about one inch from the cylinder, and the excitation performed by the silk only. A stream of fire was seen between the cushion and the silk; and much fewer sparks passed between the balls of the electrometer.

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3. A

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Glass easily broke by electricity when covered with cement.

160
Nicholson's experiments on excitation, &c.

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"3. A roll of dry silk was interposed, to prevent the stream from passing between the cushion and the silk. Very few sparks then appeared at the electrometer.

"4. A metallic rod, not insulated, was then interposed instead of the roll of silk, so as not to touch any part of the apparatus. A dense stream of electricity appeared between the rod and the silk, and the conductor gave very many sparks.

"5. The knob of a jar being substituted in the place of the metallic rod, it became charged negatively.

"6. The silk alone, with a piece of tin-foil applied behind it, afforded much electricity, though less than when the cushion was applied with a light pressure. The hand being applied to the silk as a cushion, produced a degree of excitation seldom equalled by any other cushion.

"7. The edge of the hand answered as well as the palm.

"8. When the excitation by a cushion was weak, a line of light appeared at the anterior part of the cushion, and the silk was strongly disposed to receive electricity from any uninsulated conductor. These appearances did not obtain when the excitation was by any means made very strong.

"9. A thick silk, or two or more folds of silk, excited worse than a single very thin flap. I use the silk which the milliners call Persian.

"10. When the silk was separated from the cylinder, sparks passed between them; the silk was found to be in a weak negative, and the cylinder in a positive, state.

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The silk flap the principal cause of excitation.

"The foregoing experiments show that the office of the silk is not merely to prevent the return of electricity from the cylinder to the cushion, but that it is the chief agent in the excitation; while the cushion serves only to supply the electricity, and perhaps increase the pressure at the entering part. There likewise seems to be little reason to doubt but that the disposition of the electricity to escape from the surface of the cylinder is not prevented by the interposition of the silk, but by a compensation after the manner of a charge; the silk being then as strongly negative as the cylinder is positive: and, lastly, that the line of light between the silk and cushion in weak excitations does not consist of returning electricity, but of electricity which passes to the cylinder, in consequence of its not having been sufficiently supplied during its contact with the rubbing surface.

"11. When the excitation was very strong in a cylinder newly mounted, flashes of light were seen to fly across its inside, from the receiving surface to the surface in contact with the cushion, as indicated by the brush figure. These made the cylinder ring as if struck with a bundle of small twigs. They seem to have arisen from part of the electricity of the cylinder taking the form of a charge. This appearance was observed in a 9-inch and a 12-inch cylinder, and the property went off in a few weeks. Whence it appears to have been chiefly occasioned by the rarity of the internal air produced by handling, and probably restored by gradual leaking of the cement.

162
State of the inside of a cylinder during excitation determined.

"12. With a view to determine what happens in the inside of the cylinder, recourse was had to a plate machine. One cushion was applied with its silken flap. The plate was 9 inches in diameter and $\frac{1}{2}$ inch thick. During the excitation, the surface oppo-

site to the cushion strongly attracted electricity, which it gave out when it arrived opposite to the extremity of the flap: so that a continual stream of electricity passed through an insulated metallic bow terminating in balls, which were opposed, the one to the surface opposite the extremity of the silk, and the other opposite to the cushion; the former ball showing positive and the latter negative signs. The knobs of two jars being substituted in the place of these balls, the jar applied to the surface opposed to the cushion was charged negatively, and the other positively. This disposition of the back surface seemed, by a few trials, to be weaker the stronger the action of the cushion, as judged by the electricity on the cushion side.

"Hence it follows, that the internal surface of a cylinder is so far from being disposed to give out electricity during the friction by which the external surface acquires it, that it even greedily attracts it.

"13. A plate of glass was applied to the revolving plate, and thrust under the cushion in such a manner as to supply the place of the silk flap. It rendered the electricity stronger, and appears to be an improvement of the plate machine; to be admitted if there were not essential objections against the machine itself.

"14. Two cushions were then applied on the opposite surfaces with their silk flaps, so as to clasp the plate between them. The electricity was received from both by applying the finger and thumb to the opposite surfaces of the plate. When the finger was advanced a little towards its correspondent cushion, so that its distance was less than between the thumb and its cushion, the finger received strong electricity, and the thumb none; and, contrariwise, if the thumb were advanced beyond the finger, it received all the electricity, and none passed to the finger. This electricity was not stronger than was produced by the good action of one cushion applied singly.

"15. The cushion in experiment 12. gave most electricity when the back surface was supplied, provided that surface was suffered to retain its electricity till the rubbed surface had given out its electricity.

"From the two last paragraphs it appears, that no advantage is gained by rubbing both surfaces; but that a well managed friction on one surface will accumulate as much electricity as the present methods of excitation seem capable of collecting; but that, when the excitation is weak, on account of the electric matter not passing with sufficient facility to the rubbed surface, the friction enables the opposite surface to attract or receive it, and if it be supplied, both surfaces will pass off in the positive state; and either surface will give out more electricity than is really induced upon it, because the electricity of the opposite surface forms a charge. It may be necessary to observe, that I am speaking of the facts or effects produced by friction; but how the rubbing surfaces act upon each other to produce them, whether by attraction or otherwise, we do not here enquire.

"It will hereafter be seen, that plate machines do not collect more electricity than cylinders (in the hands of the electrical operators of this metropolis) do with half the rubbed surface; which is a corroboration of the inference here made.

"16. When a cylinder is weakly excited, the appearances mentioned (par. 8.) are more evident the more rapid

163.
No advantage gained by rubbing two sides of the plate machine.

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Velocity necessary to produce the utmost degree of excitation.

rapid the turning. In this case, the avidity of the surface of the cylinder beneath the silk is partly supplied from the edge of the silk, which throws back a broad cascade of fire, sometimes to the distance of above 12 inches. From these causes it is that there is a determinate velocity of turning required to produce the maximum of intensity in the conductor. The stronger the excitation, the quicker may be the velocity; but it rarely exceeds five feet of the glass to pass the cushion in a second.

"17. If a piece of silk be applied to a cylinder, by drawing down the ends so that it may touch half the circumference, and the cylinder be then turned and excited by applying the amalgamated leather, it will become very greedy of electricity during the time it passes under the silk. And if the entering surface of the glass be supplied with electricity, it will give it out at the other extremity of contact; that is to say, if insulated conductors be applied at the touching ends of the silk, the one will give, and the other receive, electricity, until the intensities of their opposite states are as high as the power of the apparatus can bring them; and these states will be instantly reversed by turning the cylinder in the opposite direction.

165
How to produce both electricities in the same conductor.

"As this discovery promises to be of the greatest use in electrical experiments, because it affords the means of producing either the plus or minus states in one and the same conductor, and of instantly repeating experiments with either power, and without any change of position or adjustment of the apparatus, it evidently deserved the most minute examination.

"18. There was little hope (par. 6.) that cushions could be dispensed with. They were therefore added; and it was then seen, that the electrified conductors were supplied by the difference between the action of the cushion which had the advantage of the silk, and that which had not; so that the naked face of the cylinder was always in a strong electric state. Methods were used for taking off the pressure of the receiving cushion; but the extremity of the silk, by the construction, not being immediately under that cushion, gave out large flashes of electricity with the power that was used. Neither did it appear practicable to present a row of points or other apparatus to intercept the electricity which flew round the cylinder; because such an addition would have materially diminished the intensity of the conductor, which in the usual way was such as to flash into the air from rounded extremities of four inches diameter, and made an inch and half ball become luminous and blow like a point. But the greatest inconvenience was, that the two states with the backward and forward turn were seldom equal; because the disposition of the amalgam on the silk, produced by applying the leather to the cylinder in one direction of turning, was the reverse of what must take place when the contrary operation was performed.

"Notwithstanding all this, as the intensity with the two cushions was such as most operators would have called strong, the method may be of use, and I still mean to make more experiments when I get possession of a very large machine which is now in hand.

166
Improved method of excitation.

"19. The more immediate advantage of this discovery is, that it suggested the idea of two fixed cushions with a moveable silk flap and rubber. Upon this principle, which is so simple and obvious, that it is wonderful it

should have been so long overlooked, I have constructed a machine with one conductor, in which the two opposite and equal states are produced by the simple process of loosening the leather-rubber, and letting it pass round with the cylinder (to which it adheres) until it arrives at the opposite side, where it is again fastened. A wish to avoid prolixity prevents my describing the mechanism by which it is let go and fastened in an instant, at the same time that the cushion is made either to press or is withdrawn, as occasion requires.

"20. Although the foregoing series of experiments naturally lead us to consider the silk as the chief agent in excitation; yet as this business was originally performed by a cushion only, it becomes an object of enquiry to determine what happens in this case.

"21. The great Beccaria inferred, that in a simple cushion, the line of fire, which is seen at the extremity of contact from which the surface of the glass recedes, consists of returning electricity; and Dr Nooth grounded his happy invention of the silk flap upon the same supposition. The former asserts, that the lines of light both at the entering and departing parts of the surface are absolutely similar; and thence infers, that the cushion receives on the one side, as it certainly does on the other. I find, however, that the fact is directly contrary to this assertion; and that the opposite inference ought to be made, as far as this indication can be reckoned conclusive: for the entering surface exhibits many luminous perpendiculars to the cushion, and the departing surface exhibits a neat uniform line of light. This circumstance, together with the consideration that the line of light behind the silk in par. 8. could not consist of returning electricity, showed the necessity of farther examination. I therefore applied the edge of the hand as a rubber, and by occasionally bringing forward the palm, I varied the quantity of electricity which passed near the departing surface. When this was the greatest, the sparks at the electrometer were the most numerous. But as the experiment was liable to the objection that the rubbing surface was variable, I pasted a piece of leather upon a thin flat piece of wood, then amalgamated its whole surface, and cut its extremity off in a neat right line close to the wood. This being applied by the constant action of a spring against the cylinder, produced a weak excitation; and the line where the contact of the cylinder and leather ceased (as abruptly as possible) exhibited a very narrow fringe of light. Another piece of wood was prepared of the same width as the rubber, but one quarter of an inch thick, with its edges rounded, and its whole surface covered with tin-foil. This was laid on the back of the rubber, and was there held by a small spring, in such a manner as that it could be slid on ward, so as occasionally to project beyond the rubber, and cover the departing and excited surface of the cylinder without touching it. The sparks at the electrometer were four times as numerous when this metallic piece was thus projected; but no electricity was observed to pass between it and the cylinder. The metallic piece was then held in the hand to regulate its distance from the glass; and it was found, that the sparks at the electrometer increased in number as it was brought nearer, until light appeared between the metal and the cylinder; at which time they became fewer the nearer it was brought, and at last ceased when it was in contact.

Miscellaneous Experiments.

167
In what manner excitation is performed by a simple rubber without a silk flap.

"The

Miscellaneous Experiments.

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Conclusions from these experiments.

The following conclusions appear to be deducible from these experiments. 1. The line of light on a cylinder departing from a simple cushion consists of returning electricity: 2. The projecting part of the cushion compensates the electricity upon the cylinder, and by diminishing its intensity prevents its striking back in such large quantities as it would otherwise do: 3. That if there was no such compensation, very little of the excited electricity would be carried off: And, 4. That the compensation is diminished, or the intensity increased, in an higher ratio than that of the distance of the compensating substance; because if it were not, the electricity which has been carried off from an indefinitely small distance, would never fly back from a greater distance and form the edge of light.

169

How to increase the intensity of electricity to a great degree.

" 22. I hope the considerable intensity I shall speak of will be an apology for describing the manner in which I produce it. I wish the theory of this very obscure process were better known; but no conjecture of mine is worth mentioning. The method is as follows:

" Clean the cylinder, and wipe the silk.

" Grease the cylinder by turning it against a greased leather till it is uniformly obscured. I use the tallow of a candle.

" Turn the cylinder till the silk flap has wiped off so much of the grease as to render it semitransparent.

" Put some amalgam on a piece of leather, and spread it well, so that it may be uniformly bright. Apply this against the turning cylinder. The friction will immediately increase, and the leather must not be removed until it ceases to become greater.

" Remove the leather, and the action of the machine will be very strong.

" My rubber, as before observed, consists of the silk flap pasted to a leather, and the cushion is pressed against the silk by a slender spiral spring in the middle of its back. The cushion is loosely retained in a groove, and rests against the spring only, in such a manner that by a sort of libration upon it as a fulcrum, it adapts itself to all the irregularities of the cylinder, and never fails to touch it in its whole length. There is no adjustment to vary the pressure, because the pressure cannot be too small when the excitation is properly made. Indeed, the actual withdrawing of the cushion to the distance of $\frac{1}{10}$ th of an inch from the silk, as in par. 2. will not materially affect a good excitation.

" The amalgam is that of Dr Higgins, composed of zinc and mercury. If a little mercury be added to melted zinc, it renders it easily pulverable, and more mercury may be added to the powder to make a very soft amalgam. It is apt to crystallize by repose, which seems in some measure to be prevented by triturating it with a small proportion of grease; and it is always of advantage to triturate it before using.

" A very strong excitation may be produced by applying the amalgamed leather to a clean cylinder with a clean silk: but it soon goes off, and is not so strong as the foregoing, which lasts several days.

170
Effects of different cylinders excited in this manner.

" 23. To give some distinctive criterions by which other electricians may determine whether the intensity they produce exceeds or falls short of that which this method affords, I shall mention a few facts.

" With a cylinder 7 inches diameter and cushion 8 inches long, three brushes at a time constantly flew out

of a 3-inch ball in a succession too quick to be counted, and a ball of $1\frac{1}{2}$ inch diameter was rendered luminous, and produced a strong wind like a point. A 9-inch cylinder with an 8-inch cushion occasioned frequent flashes from the round end of a conductor 4 inches diameter: with a ball of $2\frac{1}{2}$ inches diameter the flashes ceased now and then, and it began to appear luminous: a ball of $1\frac{1}{2}$ inch diameter first gave the usual flashes; then, by quicker turning, it became luminous with a bright speck moving about on its surface, while a constant stream of air rushed from it; and, lastly, when the intensity was greatest, brushes of a different kind from the former appeared. These were less luminous but better defined in the branches; many started out at once with a hoarse sound. They were reddish at the stem, sooner divided, and were greenish at the point next the ball, which was brass. A ball of $\frac{4}{8}$ ths of an inch diameter was surrounded by a steady faint light, enveloping its exterior hemisphere, and sometimes a flash struck out at top. When the excitation was strongest, a few flashes struck out sideways. The horizontal diameter of the light was longest, and might measure one inch, the stem of the ball being vertical.

" This last phenomenon is similar to a natural event related by M. Loammi Baldwin*, who raised an electrical kite in July 1771 during the approach of a severe thunder-storm, and observed himself to be surrounded by a rare medium of fire, which as the cloud rose nearer the zenith, and the kite rose higher, continued to extend itself with some gentle faint flashes. Mr Baldwin felt no other effect than a general weakness in his joints and limbs, and a kind of listless feeling; all which he observes might possibly be the effect of surprise, though it was sufficient to discourage him from persisting in any farther attempt at that time. He therefore drew in his kite, and retired to a shop till the storm was over, and then went to his house, where he found his parents and friends much more surprised than he had been himself; who, after expressing their astonishment, informed him, that he appeared to them (during the time he was raising the kite) to be in the midst of a large bright flame of fire, attended with flashings: and that they expected every moment to see him fall a sacrifice to the flame. The same was observed by some of his neighbours, who lived near the place where he stood.

" This fact is similar to another observed by M. de Saussure on the Alps, and both are referable to my luminous ball with the second kind of brush. The cloud must have been negative.

" With a 12-inch cylinder and rubber of $7\frac{1}{2}$ inches, a five-inch ball gave frequent flashes, upwards of 14 inches long, and sometimes a 6-inch ball would flash. I do not mention the long spark, because I was not provided with a favourable apparatus for the two larger cylinders. The 7-inch cylinder affords a spark of $10\frac{1}{2}$ inches at best. The 9-inch cylinder, not having its conductor insulated on a support sufficiently high, afforded flashes to the table which was 14 inches distant. And the 12-inch cylinder, being mounted only as a model or trial for constructing a larger apparatus, is defective in several respects which I have not thought fit to alter. When the five-inch ball gives flashes, the cylinder is enveloped on all sides with fire which rushes from the receiving part of the conductor.

Fig. 90.

Fig. 88. Fig. 86.

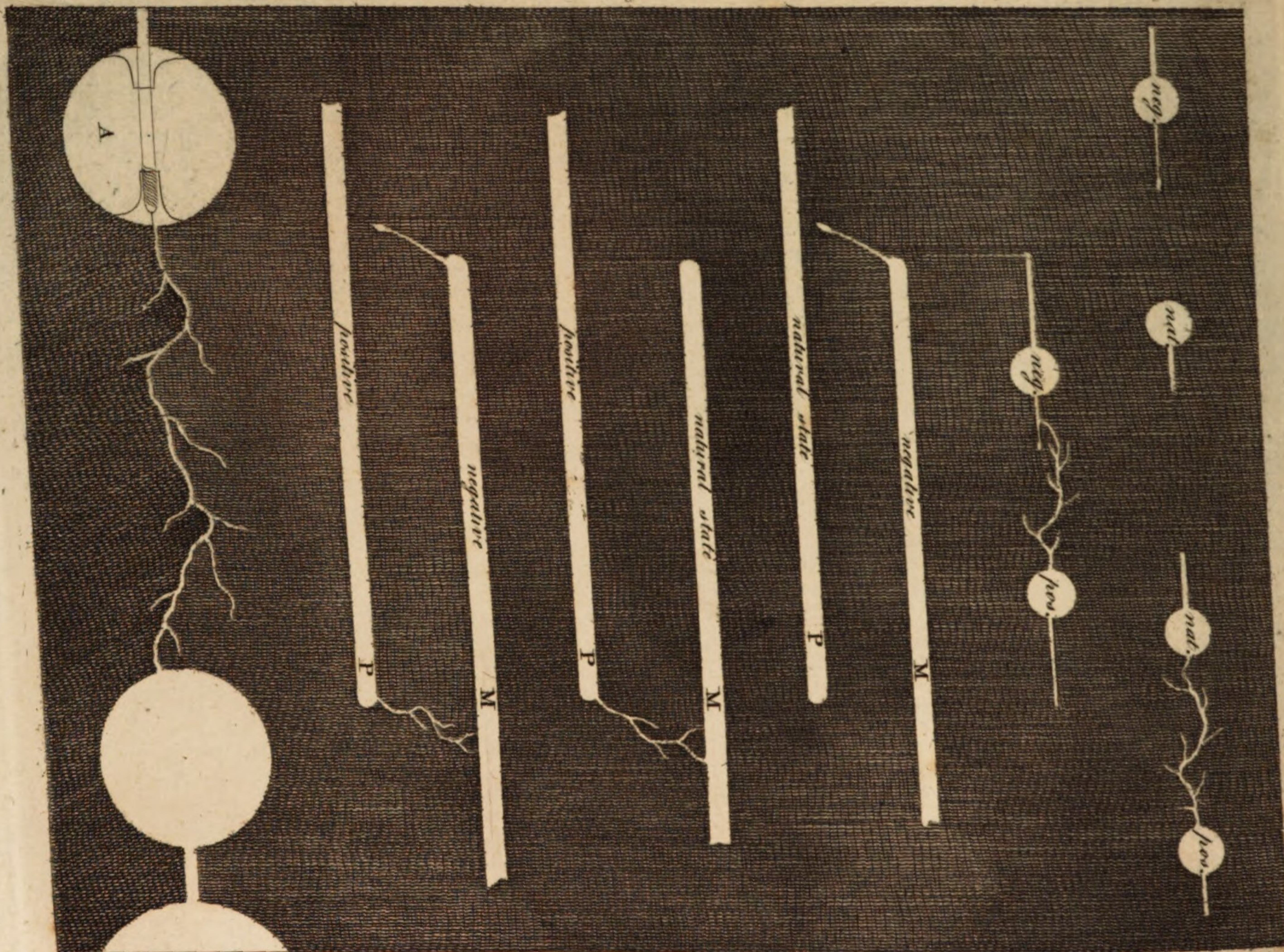


Fig. 92.

Fig. 91.

Fig. 89.

Fig. 87.

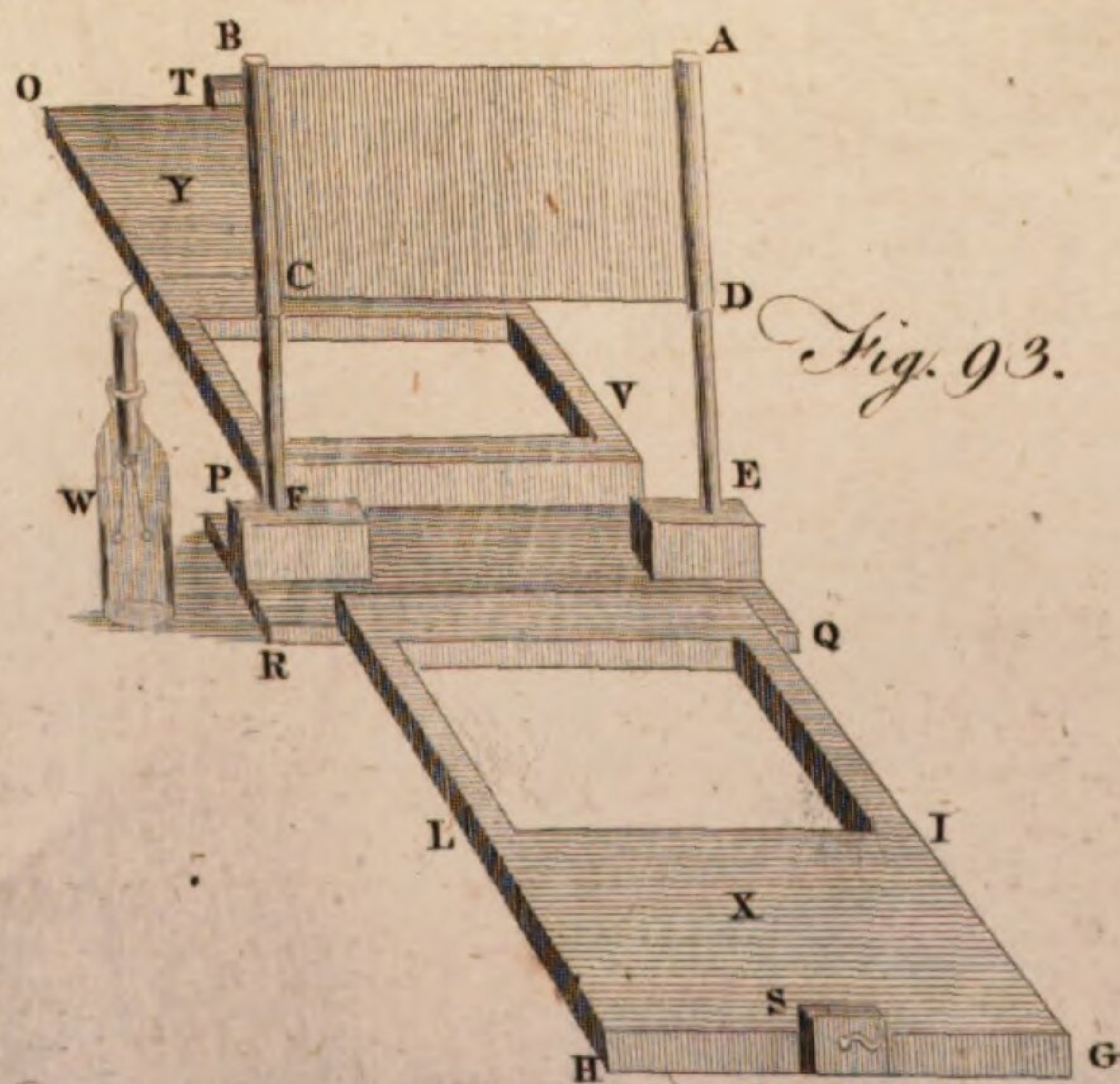


Fig. 93.

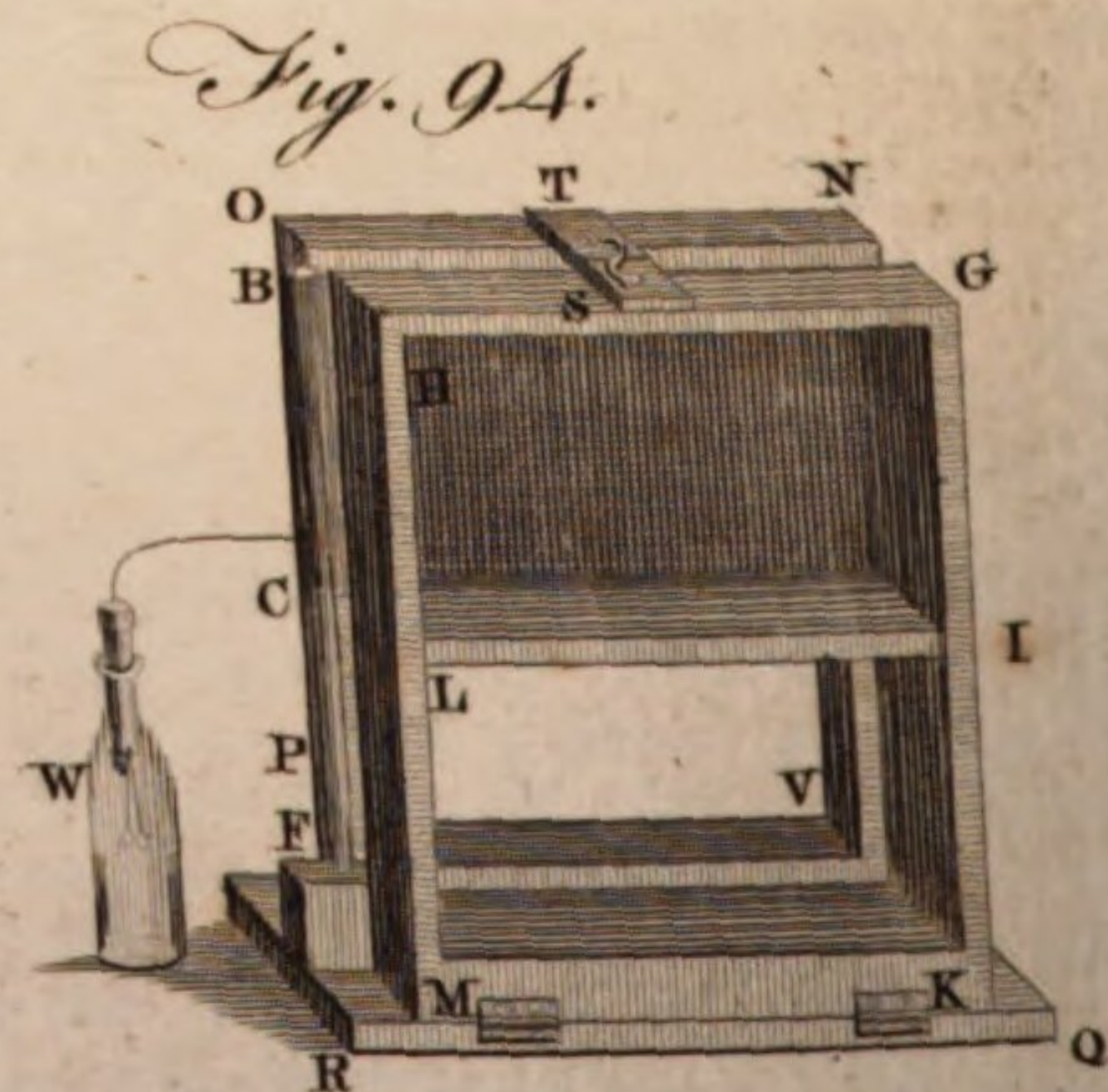


Fig. 94.

A. Bell. Prin. Wat. Sculptor. fecit.

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Jars charged by them.

173
Mr Nicholson's machines superior to Van Marum's

174
Gradual improvement in excitation.

175
Difference in the appearance of positive and negative sparks.

I never use points, but in a simple machine bring the conductor almost in contact with the cylinder. In this apparatus that cushion to which the rubber is not applied serves that purpose.

"24. These marks exhibit the intensity as deduced from simple electrifying. I will now mention the rate of charging, which was nearly the same in all the three cylinders.

"A large jar of 350 square inches, or near $2\frac{1}{2}$ square feet, with an uncoated varnished rim of more than four inches in height, was made to explode spontaneously over the rim. The jar, when broken, proved to be 0.082 inches thick on an average; and the number of square feet of the surface of the cylinder which was rubbed to produce the charge of one foot, was, when least, 18.03, and when most, with good excitation,

19.34. The great machine at Haarlem charges a single jar of one foot square by the friction of 66.6 square feet, and charges its battery of 225 square feet at the rate of 9.48 square feet rubbed for each foot. The intensity of electricity on the surface of the glass is therefore considerably less than $\frac{1}{4}$ th of that here spoken of; but if we take the most favourable number 66.6 at the commencement of turning, and halve it on account of the unavoidable imperfection of a plate machine (as shown in par. 14.), it will be found, that the management applied to that machine would cause a cylinder to charge one square foot by the friction of $33\frac{1}{2}$ square feet. It must be observed, however, that M. Van Marum's own machine, consisting of two plates 33 inches diameter, has only half the intensity, though he reckons it a very good one. This machine is about equal in absolute power to my 9-inch cylinder, with its short rubber; but it is near 30 times as dear in price. In all these deductions I omit the computations, for the sake of brevity, and because they are easily made. The data are found in the description of the Teylerian machine, and its continuation published at Haarlem in the years 1785 and 1787.

"I shall here take the liberty of observing, that the action of the cylinder, by a simple cushion or the hand, which excited the astonishment of all Europe, in the memory of our contemporaries, was first improved by the addition of a leathern flap; then by moistening the rubber; afterwards by applying the amalgam; and, lastly, by the addition of a silk flap. Now I find by experiment, that we at present obtain upwards of 40 times the intensity which the bare hand produces; and consequently, that, since 18 times our present intensity will equal the utmost we can now condense on strong glass even in the form of a charge, we have a less step to take before we arrive at that amazing power than our immediate predecessors have already made. My 9-inch cylinder, when broken, proved to be $\frac{1}{27}$ of an inch thick.

"25. Some of the luminous appearances with balls in the positive state, have been slightly noticed as criterions of intensity. I shall here add, that the escape of negative electricity from a ball is attended with the appearance of straight sharp sparks with a hoarse or chirping noise. When the ball was less than two inches in diameter, it was usually covered with short flames of this kind, which were very numerous.

"26. When two equal balls were presented to each other, and one of them was rendered strongly positive,

while the other remained in connection with the earth, the positive brush or ramified spark was seen to pass from the electrified ball: when the other ball was electrified negatively, and the ball, which before had been positive, was connected with the ground, the electricity (passing the same way according to Franklin) exhibited the negative flame, or dense, straight, and more luminous spark, from the negative ball; and when the one ball was electrified plus and the other minus, the signs of both electricities appeared. If the interval was not too great, the long zig-zag spark of the plus ball struck the straight flame of the minus ball, usually at the distance of about $\frac{1}{3}$ d of the length of the latter from its point, rendering the other $\frac{2}{3}$ ds very bright. Sometimes, however, the positive spark struck the ball at a distance from the negative flame. These effects are represented in Plate CLXXVIII. fig. 86, 87, 88.

"27. Two conductors of three-quarters of an inch diameter, with spherical ends of the same diameter, were laid parallel to each other, at the distance of about two inches, in such a manner as that the ends pointed in opposite directions, and were six or eight inches asunder. These, which may be distinguished by the letters *P* and *M*, were successively electrified as the balls were in the last paragraph. When one conductor *P* was positive, fig. 90. it exhibited the spark of that electricity at its extremity, and struck the side of the other conductor *M*. When the last mentioned conductor *M* was electrified negatively, fig. 89. the former being in its turn connected with the earth, the sparks ceased to strike as before, and the extremity of the electrified conductor *M* exhibited negative signs, and struck the side of the other conductor. And when one conductor was electrified *plus* and the other *minus*, fig. 91. both signs appeared at the same time, and continual streams of electricity passed between the extremities of each conductor to the side of the other conductor opposed to it. In each of these three cases, the current of electricity, on the hypothesis of a single fluid, passed the same way.

"28. In drawing the long spark from a ball of four inches diameter, I found it of some consequence that the stem should not be too short, because the vicinity of the large prime conductor altered the disposition of the electricity to escape: I therefore made a set of experiments, the result of which showed, that the disposition of balls to receive or emit electricity is greatest when they stand remote from other surfaces in the same state; and that between this greatest disposition in any ball, whatever may be its diameter, every possible less degree may be obtained by withdrawing the ball towards the broader or less convex surface out of which its stem projects, until at length the ball, being wholly depressed beneath that surface, loses the disposition entirely. From these experiments it follows, that a variety of balls is unnecessary in electricity; because any small ball, if near the prime conductor, will be equivalent to a larger ball whose stem is longer.

"29. From comparing some experiments made by myself many years ago with the present set, I considered a point as a ball of an indefinitely small diameter, and constructed an instrument consisting of a brass ball of six inches diameter, through the axis of which a stem, carrying a fine point, was screwed. When this stem

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stem is fixed in the prime conductor, if the ball be moved on its axis in either direction, it causes the fine point either to protrude through a small hole in its external surface, or to withdraw itself; because by this means the ball runs along the stem. The disposition of the point to transmit electricity may thus be made equal to that of any ball whatever, from the minutest size to the diameter of six inches. See fig. 92. *A*.

"30. The action of pointed bodies has been a subject of discussion ever since it was first discovered, and is not yet well explained. To those who ascribe this effect to the figure of electric atmospheres, and their disposition to fly off, it may be answered, that they ought first to prove their existence, and then show why the cause which accumulated them does not prevent their escape; not to mention the difficulty of explaining the nature of negative atmospheres. If these be supposed to consist of electrified air, it will not be easy to show why a current of air passing near a prime conductor does not destroy its effects. The opinion supported by the celebrated Volta and others, that a point is the coating to an infinitely small plate of air, does not appear better founded: for such a plate must be broken through at a greater distance only because higher charged; whence it would follow, that points should not act but at high intensities. I must likewise take notice, as a proof that the charge has little to do here, that if a ball be presented to the prime conductor, at the same time that a point proceeds from the opposite side of the ball, the electricity will pass by the point, though it is obliged to go round the ball for that purpose; but it can hardly be doubted, that whatever charge obtains in this case is on the surface of the ball next the conductor, and not on the remote side to which the electricity directs its course.

"31. The pointed apparatus described (par. 29.) shows that the effect of points depends on the remoteness of their extremities from the other parts of the conductor. This leads to the following general law: *In any electrified conductor, the transition or escape of electricity will be made chiefly from that part of the surface which is the most remote from the natural state.* Thus in the apparatus of the ball and stem, the point having a communication with the rest of the whole conductor, constantly possesses the same intensity; but the influence of the surrounding surface of the ball diminishes its capacity. This diminution is less the farther the ball is withdrawn, and consequently the point will really possess more electricity, and be more disposed to give it out when it is prominent than when depressed. The same explanation serves for negative electricity.

"32. The effect of a positive surface appears to extend farther than that of a negative: for the point acts like a ball when considerably more prominent if it be positive than it will if negative.

"For the sake of conciseness, I pass over many facts which have presented themselves in the course of my experiments on the two electricities, and content myself with observing, that there is scarcely any experiment made with the positive power, which will not afford a result worthy of notice, if repeated with the negative."

With regard to the direction of the electric fluid, we shall only farther take notice of two experiments,

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which have been thought to prove directly the passage of the fluid outward from the positive and inward to the negative side of the phial. Fig. 18. represents an electric jar, whose exterior coating is made up of small pieces of tin-foil placed at a small distance from each other. This jar is to be charged in the usual manner, when small sparks of the electric fluid will pass from one piece of tin-foil to the other, in various directions, forming a very pleasing spectacle. The separation of the tin-foil is the cause of this visible passage of the fluid from the outside to the table; and the experiment is similar in appearance to that of the spiral tube mentioned in the foregoing section. If the jar be discharged by bringing a pointed wire gradually to the knob *I*, the unsealed part of the glass between the wire and knob will be agreeably illuminated with a crackling noise of the sparks. If the jar be suddenly discharged, the whole outside will be illuminated. The jar, in this experiment, must be very dry when used.

Fig. 19. represents two jars, or Leyden phials, placed one over the other, by which various experiments may be made in order to elucidate the common theory. Bring the outside coating of the bottle *A* in contact with the prime conductor, and turn the machine till the bottle is charged; then place one ball of the discharging rod upon the coating of *B*, and with the other touch the knob of the jar *A*, which will cause an explosion; now place one ball of the discharger on the knob *A*, and bring the other ball to its coating, and you have a second discharge. Again, apply one ball of the discharger to the coating of *B*, and carry the other to the coating of *A*, and it will produce a third discharge. A fourth is obtained by applying the discharger from the coating of *A* to its knob. The outer coating of the under jar communicating with the inside of the under one, conveys the fluid from the conductor to the large jar, which is therefore charged positively: the upper jar does not charge, because the inside cannot part with any of its electric fluid; but when a communication is formed from the outside of *A* to the inside of *B*, part of the fire on the inside of *A* will be conveyed to the negative coating of *B*, and the jar will be discharged. The second explosion is occasioned by the discharge of the jar *A*; but as the outside of this communicates, by conducting substances, with the positive inside of the jar *B*, if the ball of the discharging rod remains for a little time after the discharge on the knob of *A*, part of the fire of the inside of *A* will escape, and be replaced by an equal quantity on the outside from the jar *B*, by which means *A* is charged a second time; the discharge of this produces the third, and of *B* the fourth explosion.

Fig. 20. is an electric jar, which serves to illustrate the contrary states of the side of a Leyden phial while charging. *BB* is the tin-foil coating; *C* a stand which supports the jar; *D* a socket of metal, carrying the glass rod *E*, a bent brass wire pointed at each end, and fixed at the end of the rod *G*; which rod is moveable in the spring tube *N* at pleasure: that tube being fixed by a socket on the top of the glass rod *E*, the jar is charged by the inside wire, which communicates with the different divisions of the inside coating by horizontal wires.

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Place

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Place the jar to the conductor as usual; and, when charging, a luminous speck will appear upon the upper point of the wire at *F*, clearly showing, according to the commonly received opinion, that the point is then receiving the electric fluid. From the upper ring of coating *B*, on the outside of the jar, a fine stream or pencil of rays will at the same time fly off, beautifully diverging from the lower point of the wire *F* upon the bottom ring of the coating of the jar. When the appearances cease, which they do when the jar is charged, let a pointed wire be presented towards the conductor: this will soon discharge the jar silently; during which the point will be illuminated with a small spark, while the upper point of the wire will throw off a pencil of rays diverging towards the upper ring of the coating.

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Experiments on the various kinds of airs with Dr Van Marum's great electrical machine.

We shall conclude this section with an account of some effects of the electrical fluid upon various elastic vapours. These were tried to the greatest advantage by Dr Van Marum with the great machine already mentioned: and for this purpose he used a cylindrical glass receiver five inches long and an inch and a quarter in diameter, into which different sorts of elastic fluids were successively inserted, and were confined by quicksilver or water. To a hole made in the bottom of the inverted glass receiver an iron wire was fastened, the external part of which communicated with a conductor, which being presented to the prime conductor of the machine, received the sparks from it. In this disposition of the apparatus it evidently appears, that the sparks passed through the elastic fluid contained in the receiver, by going from the inner extremity of the wire to the quicksilver or water in which the receiver was inverted. With this apparatus it was found, that dephlogisticated air, obtained from mercurial red precipitate, lost $\frac{1}{10}$ th of its bulk; but its quality was not sensibly altered, as it appeared from examining it with the eudiometer. This experiment being repeated when the receiver was inverted in lime-water, and likewise in the infusion of turnsole, there ensued no precipitation, no change of colour, nor any phlogistication of the air. On pouring out this air, the usual smell of the electric fluid was perceived very sensibly.

Nitrous air was diminished of more than the half of its original bulk; and in that diminished state, being mixed with common air, it occasioned no red colour, nor any sensible diminution. It had lost its usual smell, and it extinguished a candle. In passing the sparks through the nitrous air, a powder is formed on the surface of the quicksilver, which is a part of that metallic substance dissolved by the nitrous acid.

Inflammable air, obtained from iron and diluted vitriolic acid, communicated a little redness to the tincture of turnsole. The stream of electric fluid through this air appeared more red, and much larger, than in common air, being every where surrounded by a faint blue light.

The inflammable air, obtained from spirit of wine and vitriolic acid, was increased to about three times its original bulk, and lost a little of its inflammability.

Fixed air, from chalk and vitriolic acid, was a little increased in bulk by the action of electricity; but it was rendered less absorbable by water.

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Vitriolic acid air, obtained from vitriolic acid and charcoal, was diminished a little, and black spots were formed on the inside of the glass receiver. Afterwards it was observed, that only one-eighth part of the electrified elastic fluid was absorbed by water. It extinguished a candle, and had very little smell.

Marine acid air seemed to oppose in great measure the passage of the electric fluid; since the sparks would not pass through a greater length than $2\frac{1}{2}$ th inches of this air. It was considerably diminished, but the rest was readily absorbed by water.

Spathous air was neither diminished, nor any other way sensibly altered, by the electric sparks.

Alkaline air, extracted from spirit of sal ammoniac, was at first almost doubled in bulk; then it was diminished a little; after which it remained without any augmentation or diminution. It became unabsorbable by water, and by the contact of flame it exploded, like a mixture of inflammable air and a good deal of common air.

Common air was lastly tried, and it was found to give a little faint redness to the tincture of turnsole; becoming at the same time sensibly phlogisticated. The experiment was repeated thrice at different times, and in each time after the electrization it was examined by the admixture of nitrous air in Mr Fontana's eudiometer, and it was compared with the same air not electrified; the latter always suffering the greatest diminution. In the first experiment the diminutions were $\frac{1}{10}$ th and $\frac{1}{10}$ th; in the second, $\frac{1}{10}$ th and $\frac{1}{10}$ th; and in the last, $\frac{1}{10}$ th and $\frac{1}{10}$ th.

On attempting to repeat Mr Cavendish's experiment,* in which he produced the nitrous acid by a mixture of pure with phlogisticated air; instead of a syphon, the Doctor made use of a glass tube $\frac{1}{2}$ th part of an inch in diameter, closed at one end, into which an iron wire, $\frac{1}{10}$ th of an inch in diameter, had been inserted: into this tube, filled with mercury, and fixed in a vertical position, was introduced the air with which the experiment was to be tried. The dephlogisticated air was obtained from red precipitate, and had been thoroughly purified by alkaline salts, from any acid it might have contained. With a mixture of 5 parts of this and 3 of common air, the tube was filled to the height of 3 inches, to which was added $\frac{1}{10}$ th of an inch of lixivium, of the same kind with that used by Mr Cavendish. The result was, that, after transmitting through the tube a continued stream of the electrical fluid during 15 minutes, 2 inches of the air were absorbed by the lixivium: more air being introduced into the tube till it was filled to the height of 3 inches, when it was again electrified. This process was repeated till $8\frac{1}{2}$ th inches of air had been absorbed by the lixivium: this was now examined, and found to be, in some degree, impregnated with the nitrous acid; but it was very far from being saturated. With the same lixivium, of which a quarter of an inch remained in the tube, the experiment was continued till 14 inches more of air had been absorbed; but its diminution was not perceived to decrease, though the lixivium had now absorbed 77 measures of air, each equal to its own; whereas, in the experiment related by Mr Cavendish, only 38 measures of air were absorbed by the alkali. But notwithstanding this greater

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greater absorption, the lixivium was yet far from being saturated.

The experiment was repeated with pure air, produced by minium, moistened with the vitriolic acid, and deprived of its fixed air; seven parts of this were mixed with three of phlogisticated air, and lixivium added to the height of $\frac{1}{8}$ th of an inch. Here, as in the former experiment, the diminution continued without any decrease; and the lixivium, after it had absorbed $22\frac{1}{2}$ th inches, and consequently 178 times its own measure of air, was very far from being saturated with the nitrous acid.

On this Dr Van Marum wrote to Mr Cavendish; and finding, by his answer, that this gentleman had used pure air, obtained from a black powder produced by shaking mercury with lead, he requested to be informed of the process by which it is generated: but Mr Cavendish, not choosing to communicate this at present, he determined to defer the repetition of the experiment till this ingenious philosopher shall have published his mode of obtaining the pure air used in it.

Our author then goes on to some experiments made by suffering the electric fluid to pass in a continued stream through various kinds of air, inclosed for this purpose in the little glass tube used in the last experiments.

Pure air obtained the week before from red precipitate, being placed over mercury, and electrified for 30 minutes, was diminished by $\frac{1}{4}$ th, the surface of the quicksilver soon began to be calcined, and towards the end of the experiment the glass tube was so lined with the calx as to cease to be transparent. By introducing a piece of iron, the electric stream was made to pass through the air without immediately touching the mercury; yet this was equally calcined. This phenomenon the Doctor ascribes solely to the dissolution of the pure air, the principle of which unites itself with the metal; as in these experiments the mercury had not acquired any sensible heat. Two inches and 3 quarters of the same kind of air being placed over water, and electrified in the same manner during half an hour, lost a quarter of an inch; and being suffered to stand 12 hours in the tube, was found to have lost $\frac{1}{8}$ th of an inch more. This was very nearly the same diminution of the air that had taken place when it was electrified over mercury; but, in this case, the process appears to be more slow, and the detached principle not so readily absorbed. The air remaining after these experiments, being tried by the eudiometer, did not differ from unelectrified pure air taken from the same receiver.

To determine whether the pure air retained any of the acid employed in its production, the Doctor repeated the experiment with air obtained from red precipitate, confined by an infusion of turnsole, but could not perceive in it the least change of colour. He also electrified air obtained from minium and the vitriolic acid, placed over some diluted vinegar of lead; but this was not rendered at all turbid.

Three inches of phlogisticated air being electrified, during the first 5 minutes were augmented to $3\frac{1}{8}$ th inches, and in the next 10 minutes to $3\frac{1}{4}$ th inches: some lixivium was then introduced to try whether this

would absorb it; but upon being electrified 15 minutes, the column rose to the height of $3\frac{1}{8}$ th inches. It was suffered to stand in the tube till the next day, when it was found to have sunk to its original dimensions.

Nitrous air, confined by lixivium, being electrified during half an hour, lost 3 quarters of its bulk; the lixivium appeared to have absorbed a great deal of nitrous acid; and the air remaining in the tube did not seem to differ from common phlogisticated air. Some of the same nitrous air, confined by lixivium, was, by standing 3 weeks, diminished to half its bulk, and this residuum also proved to be phlogisticated air. Thus electricity very speedily effects that separation of the nitrous acid from nitrous air, which is slowly produced by the lixivium alone.

Inflammable air obtained from steel-filings and the diluted vitriolic acid, being confined by an infusion of turnsole, was electrified for 10 minutes without any change of colour in the infusion, or any alteration in the bulk of the air. The tube being filled with the same air to the height of $2\frac{1}{2}$ inches, and placed in diluted vinegar of lead, was exposed to the electric stream during 12 minutes, in which time the inclosed air rose to 5 inches; but the vinegar remained perfectly clear. Three inches of inflammable air obtained from a mixture of spirits of wine with oil of vitriol, on being electrified for 15 minutes, rose to 10 inches; thus dilated, it lost all its inflammability, and when nitrous air was added, no diminution ensued.

A column of alkaline air obtained by heat from spirit of sal ammoniac, 3 inches high, was electrified 4 minutes, and rose to 6 inches, but did not rise higher when electrified 10 minutes longer. It appears that this air is not expanded more by the powerful electric stream from this machine than by the common spark. Water would not absorb this electrified air, which was in part inflammable.

The tube, being filled to the height of an inch with spirit of sal ammoniac, and inverted in mercury, was electrified 4 minutes; in which time the tube was filled with 8 inches of air, which proved to be equally inflammable, and as little absorbed by water as the alkaline air. Hence Dr Van Marum conjectures that this air is only the volatile alkali rendered elastic.

The following experiment is very curious, and may serve to illustrate some phenomena observed in thunderstorms. Two balloons, made of the allantoïdes of a calf, were filled with inflammable air, of which each contained about 2 cubic feet. To each of these was suspended, by a silken thread about 8 feet long, such a weight as was just sufficient to prevent it from rising higher in the air; they were connected, the one with the positive, the other with the negative conductor, by small wires about 30 feet in length, and being kept near 20 feet asunder, were placed as far from the machine as the length of the wires would admit. On being electrified, these balloons rose up in the air as high as the wire allowed, attracted each other, and uniting as it were into one cloud, gently descended. The rising of these artificial clouds is ascribed to the expansion of the air they contained, in consequence of the repulsive force communicated to its particles by elec-

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Curious experiment with balloons filled with inflammable air.

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electricity: when in contact, their opposite electrical powers destroyed each other, and they recovered their specific gravity by losing the cause of its diminution. In order to render this experiment more perfectly imitative, the Doctor suspended to the balloon which was connected with the negative conductor, a bladder filled with a mixture of inflammable and atmospherical air, which, being kindled by the spark that took place on the union of these clouds, gave a considerable explosion. From these experiments, the Doctor explains the sudden elevation of the clouds, and the violent showers of rain and hail, which often accompany thunder-storms.

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Dr Priestley's experiments on the effects of the electric fluid on air.

In the course of his experiments upon air and electric fluid, Dr Priestley found, that, by means of the spark, he was able to turn vegetable blues to a red colour; though we are not to imagine that this was any indication of the acidity of the electric fluid, but merely of the decomposition of the air, and its conversion into fixed air or aerial acid. The instrument used in this experiment is a glass tube about 4 or 5 inches long and 1 or $\frac{2}{3}$ ths of an inch diameter in the inside; a piece of wire is put into one end of the tube, and fixed there with cement; a brass ball is placed on the top of this wire; the lower part of the tube is to be filled with water, tinged blue with a piece of turnsole or archil. This is easily effected, by setting the tube in a vessel of the tinged water, then placing it under a receiver on the plate of the air-pump; exhaust the receiver in part, and then, on letting in the air, the tinged liquor will rise in the tube, and the elevation will be in proportion to the accuracy of the vacuum; now take the tube and vessel from under the receiver, and throw strong sparks on the brass ball from the prime conductor.

When Dr Priestley made this experiment, he perceived, that after the electric spark had been taken between the wire and the liquor about a minute, the upper part of it began to look red; in 2 minutes it was manifestly so, and the red part did not readily mix with the liquor. If the tube was inclined when the sparks were taken, the redness extended twice as far on the lower side as on the upper. In proportion as the liquor became red, it advanced nearer to the wire, so that the air in which the sparks were taken was diminished; the diameter amounted to about $\frac{1}{3}$ th of the whole space; after which, a continuance of the electrification produced no sensible effect.

To determine whether the cause of the change of colour was in the air or in the electric matter, Dr Priestley expanded the air in the tube by means of an air-pump, till it expelled all the liquor, and admitted fresh blue liquor in its place: but after this, electricity produced no sensible effect on the air or on the liquor; so that it was clear, that the electric matter had decomposed the air, and made it deposit something of an acid nature. The result was the same with wires of different metals. It was also the same when, by means of a bent tube, the spark was made to pass from the liquor in one leg to the liquor in the other. The air thus diminished was in the highest degree noxious.

In passing the electric spark through different elastic fluids, it appears of different colours. In fixed air, the spark is very white; in inflammable and

alkaline air, it appears of a purple or red colour. From hence we may infer, that the conducting power of these airs is different, and that fixed air is a more perfect non-conductor than inflammable air.

The spark was not visible in air from a caustic alkali made by M. Lane, nor in air from spirit of salt; so that they seem to be more perfect conductors of electricity than water or other fluid substances.

The electric spark, taken in any kind of oil, produces inflammable air. Dr Priestley tried it with ether, oil of olives, oil of turpentine, and essential oil of mint, taking the electric spark in them without any air to begin with; inflammable air was produced in them all.

Dr Priestley found, that on taking a small electric explosion for an hour, in the space of an inch of fixed air, confined in a glass tube $\frac{1}{10}$ th of an inch diameter, when water was admitted to it, only $\frac{1}{4}$ th of the air was imbibed. Probably the whole would have been rendered immiscible in water, if the electrical operation had been continued a sufficient time.

The electric spark, when taken in alkaline air, appears of a red colour; the electric explosions, which pass through this air, increase its bulk; so that, by making about 200 explosions in a quantity of it, the original quantity will be sometimes increased $\frac{1}{4}$ th. If water is admitted to this air, it will absorb the original quantity, and leave about as much elastic fluid as was generated by the electricity, and this elastic fluid is a strong inflammable air.

Dr Priestley found, when the electric spark was taken in vitriolic acid air, that the inside of the tube in which it was confined was covered with a blackish substance. He seems to think, that the whole of the vitriolic acid air is convertible into this black matter, not by means of any union which it forms with the electric fluid, but in consequence of the concussion given to it by the explosion; and that, if it be the calx of the metal which supplied the phlogiston, it is not to be distinguished from what metal, or indeed from what substance of any kind, the air had been extracted.

Dr Priestley made 150 explosions of a common jar in about a quarter of an ounce measure of vitriolic acid air from copper, by which the bulk was diminished about $\frac{1}{3}$, and the remainder seemingly not changed, being all absorbed by water. In the course of this process, the air was carefully transferred three times from one vessel to another; and the last vessel, in which the explosions were made, was, to all appearance, as black as the first; so that the air seems to be all convertible into this black substance.

Thinking this diminution of the vitriolic acid air might arise from its absorption by the cement with which the glass tubes employed in the last experiment were closed, he repeated it with the air from quicksilver, in a glass syphon confined by quicksilver, and the result was the same.

That this matter comes from the vitriolic acid air only, and not from any combination of the electric matter with it, will appear from the following experiment.

He took the simple electric spark from a conductor of a moderate size, for the space of 5 minutes without interruption, in a quantity of vitriolic acid

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air, without producing any change in the inside of the glass; when immediately after, making in it only two explosions of a common jar, each of which might be produced in less than a quarter of a minute with the same machine in the same state, the whole of the inside of the tube was completely covered with the black matter. Now, had the electric matter formed any union with the air, and this black matter had been the result of that combination, all the difference that would have arisen from the simple spark or the explosion, could only have been a more gradual or a more sudden formation of that matter.

A large phial, about an inch and a half wide, being filled with this air, the explosion of a very large jar, containing more than 2 feet of coated surface, had no effect upon it; from which it should seem, that in these cases the force of the shock was not able to give the quantity of air such a concussion as was necessary to decompose any part of it.

He had generally made use of copper, but afterwards he procured this air from almost every substance from which it could be obtained; the electric explosion taken in it produced the same effect. But as some of the experiments were attended with peculiar circumstances, he briefly mentions them as follows.

When he endeavoured to get vitriolic acid air from lead, putting a quantity of leaden shot into a phial containing oil of vitriol, and applying only the usual degree of heat, a considerable quantity of heat was produced; but afterwards, though the heat was increased till the acid boiled, no more air could be got. He imagined, therefore, that in this case the phlogiston had in fact been supplied by something that had adhered to the shot. However, in the air so produced, he took the electric explosion; and in the first quantity he tried, a whitish matter was produced, almost covering the inside of the tube; but in the succeeding experiments, with air produced from the same shot or from something adhering to it, there was less of the whitish matter; and at last nothing but black matter was produced, as in all the other experiments. Water being admitted to this air, there remained a considerable residuum, which was very slightly inflammable.

Vitriolic acid air is easily procured from spirit of wine, the mixture becoming black before any air is yielded. The electric explosion taken in this air also produced the black matter.

The experiments made with ether seem to throw most light upon this subject, as this air is as easily procured from ether as any other substance containing phlogiston. In the air procured by ether the electric explosion tinged the glass very black, more so than in any other experiment of the kind; and when water had absorbed what it could of this air, there was a residuum in which a candle burned with a lambent blue flame. But what was most remarkable in this experiment was, that besides the oil of vitriol becoming very black during the process, a black substance, and of a thick consistence, was formed, which swam on the surface of the acid.

It is very possible, that the analysis of this substance may be a means of throwing light upon the nature of the black matter formed by electric explosions

in vitriolic acid air, as they seem to resemble one another very much.

The electric spark or explosion taken in common air, confined by quicksilver in a glass tube, covers the inside of the tube with a black matter, which, when heated, appears to be pure quicksilver. This, therefore, may be the case with the black matter into which he supposed the vitriolic acid air to be converted by the same process, though the effect was much more remarkable than in the common air. The explosion will often produce the diminution of common air in half the time that simple sparks will do it, the machine giving the same quantity of fire in the same time: also, the blackness of the tube is much sooner produced by the shocks than by the sparks. When the tube considerably exceeds $\frac{1}{10}$ ths of an inch in diameter, it will sometimes become very black, without any sensible diminution of the quantity of air.

SECT. X. *Of the Methods of measuring Electricity both artificial and natural; of condensing and doubling it, so that the smallest Quantity may be made perceptible; of distinguishing the two Kinds of Electricity from one another, &c.*

WE have already had occasion to mention, and in part to explain, the instruments for this purpose named *electrometers*. When the electricity is very evident, many obvious contrivances may be fallen upon to determine its quality and strength, when compared with that of any other body electrified also to a considerable degree. But in many cases the quantity of electricity is so small that it does not discover itself by any of the ordinary electrometers; and in others, though the quantity be very great, yet we are destitute of any proper standard which might enable us to compare it with another of apparently the same height, or which might determine the degrees of charge which the electrified substance progressively receives.

In the former case, Dr Priestley recommends a single thread of silk as it comes from the worm; which being extremely light and flexible, very readily discovers the electric properties of any body, by being first attracted and then repelled by it: and, as this substance at the same time has a power of retaining its electricity very strongly, we have thus an opportunity of determining whether the body from which it received the electricity was positive or negative. Even this electrometer has not been found to be endowed with all the sensibility to be wished for; so that others have been contrived which answer to a still greater degree of exactness. For ordinary purposes the following instruments are most commonly made use of.

Fig. 13. represents a stand supporting the electrometers *DD*, *CC*. *B* is the basis of it, made of common wood. *A* is a pillar of wax, glass, or baked wood. To the top of the pillar, if it be of wax or glass, a circular piece of wood is fixed; but if the pillar be of baked wood, that may constitute the whole. From this circular piece of wood proceed four arms of glass, or baked wood, suspending at their ends four electrometers, two of which *DD* are silk threads about eight inches long, suspending each a small downy feather

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Description of various electrometers.

Plate CLXXIV.

Methods of measuring Electricity, &c. feather at its end. The other two electrometers *CC* are those with very small balls of cork, or of the pith of alder; and they are constructed in the following manner. *ab* is a stick of glass about six inches long, covered with sealing-wax, and shaped at top in a ring: from the lower extremity of this stick proceed two fine linen threads (κ) *cc* about five inches long, each suspending a cork or pith-ball *d* about $\frac{1}{4}$ th of an inch in diameter. When this electrometer is not electrified, the threads *cc* hang parallel to each other, and the cork-balls are in contact; but when electrified, they repel one another, as represented in the figure. When it happens to be inconvenient to use the insulating stand *AB*, the electrometers may be easily supported by a glass rod or tube.

Plate CLXXIV. Another species of the above electrometer is represented in fig. 14. which consists of a linen thread, having at each end a small cork-ball. This electrometer is suspended by the middle of the thread on any conductor proper for the purpose, and serves to show the kind and quantity of its electricity.

Fig. 15. represents Mr Henly's quadrant electrometer fixed upon a small stand, from which it may be occasionally separated and fixed upon the prime conductor, or in any other place, at pleasure. This electrometer consists of a perpendicular stem formed at the top like a ball, and furnished at its lower end with a brass ferule, by which it may be fixed in one of the holes of the prime conductor, or in its proper stand, as occasion requires. To the upper part of the stem or pillar, a graduated ivory semicircle is fixed; about the middle of which is a brass arm, which contains a pin, or the small axis of the index. The index consists of a very slender stick, which reaches from the centre of the graduated semicircle to the brass ferule, and at its lower extremity is fastened a small cork-ball, nicely turned in a lathe.

When this electrometer is not electrified, the index hangs parallel to the pillar; but when it is electrified, the index recedes more or less, according to the quantity of electricity from the stem. See *EGDI*, in fig. 14. and *ab* in fig 6. both of which are new and improved ways of applying it; by which the quantity of the shocks are regulated in the most convenient manner, as will be more particularly explained under *Medical ELECTRICITY*, Sect. XII.

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Brookes's
electrometer.
Fig 16. and 17. represent an electrometer nearly similar to that contrived by Mr Brooke. The two instruments are sometimes combined in one, or used separately, as in these figures. The arms *FHfk*, fig. 17. when in use, are to be placed as much as possible out of the atmosphere of a jar, battery, prime conductor, &c. The arm *FH* and the ball *K* are made of copper, and as light as possible. The divisions on the arm *FH* are each of them exactly a grain. They are ascertained at first by placing grain weights on a brass ball which is within the ball *L* (this ball is an exact counterbalance to the arm *FH* and the ball *K* when the small slide on this arm is at the first division); and then removing the slide till it, together with the ball *K*, counterbalances the ball *L* and the weight laid on it.

A, fig. 16. is a dial-plate, divided into 90 equal parts.

Methods of measuring Electricity, &c. The index of this plate is carried once round, when the arm *BC* has moved through 90 degrees, or a quarter of a circle. That motion is given to the index by the repulsive power of the charge acting between the ball *D* and the ball *B*.*

The arm *BC* being repelled, shows when the charge is increasing, and the arm *FH* shows what this repulsive power is between two balls of this size in grains, according to the number the weight rests at when lifted up by the repulsive power of the charge: at the same time the arm *BC* points out the number of degrees to which the ball *B* is repelled; so that, by repeated trials, the number of degrees, answering to a given number of grains, may be ascertained, and a table formed from these experiments, by which means the electrometer, fig. 16. may be used without that of fig. 17.

Mr Brookes thinks, that no glass charged (as we call it) with electricity, will bear a greater force than that whose repulsive power, between two balls of the size he used, is equal to 60 grains; that in very few instances it will stand 60 grains weight; and he thinks it hazardous to go more than 45 grains.

Hence, by knowing the quantity of coated surface, and the diameter of the balls, we may be enabled to say, so much coated surface, with a repulsion between balls of so many grains, will melt a wire of such a size, or kill such an animal, &c.

Mr Brookes thinks, that he is not acquainted with all the advantages of this electrometer; but that it is clear, it speaks a language which may be universally understood, which no other will do; for though other electrometers will show whether a charge is greater or less, by an index being repelled to greater or smaller distances, or by the charge exploding at different distances, yet the power of the charge is by no means ascertained: but this electrometer shows the force of the repulsive power in grains; and the accuracy of the instrument is easily proved, by placing the weights on the internal ball, and seeing that they coincide with the divisions on the arm *FH*, when the slide is removed to them.

Mr Achard has shown clearly, that if the scale of an electrometer is divided into equal parts (degrees for example), the angle at which the index is held suspended by the electric repulsion will not be a true measure of the repulsive force; to estimate which truly, he demonstrates that the arc of the electrometer should be divided according to a scale of arcs, the tangents of which are in arithmetical progression.

The electrometer of which this is an imitation was invented by Mr Brookes, and described in his treatise already quoted. An account of it is given in that treatise, along with a very full representation of it by plates; but as these are somewhat difficult to be understood, we must for further particulars refer to the treatise itself. On this electrometer, however, we must observe, that it is constructed on the only true principle on which machines for measuring the quantity of electricity can be made. The mere attraction of any light body shows indeed that the substance which attracts it is electrified; but this property is by no means calculated to discover the comparative strength of it, on account

(κ) These threads should be wetted in a weak solution of salt.

Methods of measuring Electricity, &c. count of its continual variation. Thus, if we hold any body within the electrified atmosphere of another, though it be first attracted pretty strongly, yet that attraction will be constantly diminishing, and at last changed into a repulsive power; but the latter, after it has once taken place, continues invariable as long as any degree of electric charge remains.

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Mr Cavallo's atmospheric electrometer.

The electricity of the atmosphere particularly, has engaged the attention of philosophers; and by reason of its infinite variety, requires the most delicate instruments to observe its minutiae. Besides the kite formerly described, which was an invention of Dr Franklin's, Mr Cavallo has invented several others. Fig. 61. represents a portable atmospheric electrometer, the principal part of which is a glass tube *CDMN*, cemented at the bottom into the brass piece *AB*, by which part the instrument is to be held when used for the atmosphere; and it also serves to screw the instrument into its brass case *ABO*, fig. 69. The upper part of the tube *CDMN* is shaped tapering to a small extremity, which is entirely covered with sealing-wax; to this tapering part a small tube is cemented; the lower extremity, being also covered with sealing-wax, projects a small way within the tube *CDMN*; into this smaller tube a wire is cemented, which with its under extremity touches the flat piece of ivory *H*, fastened to the tube by means of a cork; the upper extremity of the wire projects about a quarter of an inch above the tube, and screws into the brass cap *EF*, which cap is open at the bottom, and serves to defend the waxed part of the instrument from the rain, &c.

IM and *KN* are two narrow slips of tin-foil, stuck to the inside of the glass *CDMN*, and communicating with the brass bottom *AB*. They serve to convey that electricity which, when the balls touch the glass, is communicated to it, and being accumulated, might disturb the free motion of the balls.

To use this instrument for artificial electricity, electrify the brass cap by an electrified substance, and the divergence or convergence of the balls of the electrometer, at the approach of an excited electric, will show the quality of the electricity. The best manner to electrify this instrument is, to bring excited wax so near the cap that one or both of the corks may touch the side of the bottle *CDMN*, after which they will soon collapse and appear unelectrified. If now the wax is removed, they will again diverge, and remain electrified positively.

When this electrometer is to be used to try the electricity of the fogs, air, clouds, &c. the observer is to do nothing more than to unscrew it from its case, and hold it by the bottom *AB* to present it to the air a little above his head, so that he may conveniently see the balls *P*, which will immediately diverge if there is any electricity; i. e. whether positive or negative may be ascertained, by bringing an excited piece of sealing-wax or other electric towards the brass cap *EF*.

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M. Saussure's improvement on this electrometer.

An improvement of Mr Cavallo's electrometer has been made by M. Saussure. The principal circumstances in which they differ are, 1. The fine wires by which the balls are suspended, should not be long enough to reach the tin-foil which is pasted on the inside of the glass; because the electricity, when strong, will cause them to touch this tin-foil twice consecutive-

ly, and thus deprive them in a moment of their electricity. To prevent this defect, and yet give them a sufficient degree of motion, it is necessary to use larger glasses than those that are generally applied to Mr Cavallo's electrometer; two or three inches diameter will be found to answer the purpose very well. But as it is necessary to carry off the electricity which may be communicated to the inside of the glass, and thus be confounded with that which belongs to those substances that are under examination; four pieces of tin-foil should be pasted on the inside of the glass; the balls should not be more than $\frac{1}{8}$ th of an inch diameter, suspended by silver wire, moving freely in holes nicely rounded. The bottom of the electrometer should be of metal; for this renders it more easy to deprive them of any acquired electricity, by touching the bottom and top at the same time.

This electrometer may be used instead of the condenser of M. Volta, by only placing it on a piece of oiled silk, somewhat larger than the base of the instrument: but in this case it is the base and not the top of the instrument, which must be brought into contact with the substance whose electricity is to be explored.

By this instrument, it is easy to ascertain the degree of conducting power in any substance. For example, if it is placed on an imperfect conductor, as dry wood or marble, and if the instrument is electrified strongly, and afterwards the top is touched, the electricity will appear to be destroyed; but on lifting up the instrument by the top, the balls will again open, because the imperfect conductor formed with the base a kind of electrophorus, by which the electric fluid was condensed, and lost its tension, till the perfect conductor was separated from the imperfect one; whereas, if the conductor had been more perfect, it would have been deprived of its electricity immediately on the application of the hand.

It is easy to discover also, by this instrument, the electricity of any substance, as of cloaths, hair of different animals, &c. For this purpose, it must be held by the base, and the substance rubbed briskly (only once) by the ball of the electrometer; the kind of electricity may be ascertained in the usual manner. It is proper, however, to observe here, that as the top of the electrometer acts in this case as an insulated rubber, the electricity it acquires is always contrary to that of the rubbed body.

In order to collect a great quantity of electricity from the air, the electrometer is furnished with a pointed wire 15 inches or two feet long, which unscrews in three or four pieces, to render the instrument more portable; see fig. 62. When it rains or snows, the small cover, fig. 63. is to be screwed on the top of the instrument, as by this its insulation is preserved, notwithstanding the rain.

This instrument indicates not only the electricity of fogs, but that also of serene weather, and enables us to discover the kind of electricity which reigns in the atmosphere; and to a certain degree to form an estimate of its quantity, and that under two different points of view, the degree of intensity, and the distance from the earth at which it first begins to be sensible.

A conductor exhibits signs of electricity only when the

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How high it is necessary to raise conductors in order to produce signs of electricity.

the electric fluid is more or less condensed in the air than in the earth. Though the air resists the passage of the electric fluid, it is not absolutely impermeable to it; it suffers it to pass gradually, and generally with more ease in proportion as its mass or thickness is less. It is therefore interesting to discover at what height it is necessary to be elevated, in order to find a sensible difference between the electricity of the earth and that of the air. A very sensible difference may be generally discovered by this instrument at the distance of four or five feet from the ground; sometimes it may be seen if the instrument is placed even on the ground, while at others it must be raised seven or more feet before the balls will open; sometimes, though seldom, this height is not sufficient. This distance is generally greatest when the electricity is strongest, though necessarily modified by a variety of circumstances, some of which are known, as the degree of dryness or humidity of the air, and others are unknown.

The degree of intensity, at a given height, may be discovered thus: raise the electrometer, and judge by the divisions which are placed on the edge thereof the degree of their divergence. To find the relation between this degree of divergence and the force of the electricity, M. Saussure took the following method: As he could not with certainty double or triple a given quantity of electricity; yet as a given force may be reduced one half, a fourth, or eighth, &c. by dividing it between two equal and similar bodies, the electricity contained in one; he took two of his unarmed electrometers, which were as similar as possible, and electrified one of them, so that the balls separated precisely 6 lines: he then touched the top thereof by the top of that which was not electrified; in an instant the electricity was equally divided between them, as was evident by the divergence of the balls, which was 4 lines in each; consequently, a diminution of half the density had only lessened the divergence one third. One of these electrometers was then deprived of its electricity, and was afterwards brought in contact with the other, as before; the remaining electricity divided itself again between them, and the balls fell from 4 to 28 lines, nearly in the same proportion as before; in the third operation they fell to 19; in the fourth to one, where he was obliged to stop, as there was not now sufficient force in the fluid to pass from one electrometer to the other, and distribute itself uniformly between them. The same experiment repeated several times gave very nearly the same results. Negative e-

lectricity decreased also in the same proportion as the positive. The following table may therefore be considered as giving a general, though not exact, idea of the increase in force, which corresponds to different degrees of divergence in the balls; it is only calculated to every fourth of a line; the force of electricity is always expressed by whole numbers, as it would be ridiculous to put a greater degree of exactness in the numbers than is to be found in the experiments which form the basis of the calculation (L).

Distance of the balls in fourths of a line.		Corresponding forces of electricity.
1	—	1
2	—	2
3	—	3
4	—	4
5	—	5
6	—	6
7	—	8
8	—	10
9	—	12
10	—	14
11	—	17
12	—	20
13	—	23
14	—	26
15	—	29
16	—	32
17	—	36
18	—	40
19	—	44
20	—	48
21	—	52
22	—	56
23	—	60
24	—	64

Those who are desirous to carry this measure of the electric force further, may do it by having similar electrometers constructed, but made upon a larger scale, and with heavier balls, which would only separate one line, with the degree of electricity that makes the smaller ones diverge 6 lines; these would consequently measure a force 1024 times greater than that which forms the unity of the preceding table; and thus by degrees we may be enabled to discover the ratio of the strongest discharge of a great battery, or perhaps even of thunder itself, to that of a piece of amber, which only attracts a bit of straw or any other light substance, (M).
In

(L) M. Saussure, in a long note, anticipates the objections that may be made to the foregoing method of estimating the force of electricity; but as at the most they only show that this science is at present in a state of considerable imperfection, it will be unnecessary to take notice of them here.

(M) The consideration of the repulsive force is not sufficient to discover the absolute force of an explosion or electrical discharge: for M. Volta has shown, that the force of a discharge depends principally on the quantity of the electric fluid which passes from one body to another. Now the repulsive force of the electrometer only indicates the ratio of this quantity in equal and similar bodies, and which are also similarly situated. If equal quantities of the electric fluid were imparted to two unequal and separate conductors, the electric fluid being less condensed on the largest, would act with the least force on the electrometer; though it is probable, the force of the discharge in the two conductors would be equal. The repulsive force serves, however, to show what M. Volta calls the *electrical capacity* of a body, the quantity of the electric fluid it actually contains, or is capable of containing. To effect this, and have points of comparison, we should use light metallic balls, of different sizes, suspended by silk thread. One of these balls, unelectrified, being brought into contact with the substance:

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serve the e-
lectricity of
the atmo-
sphere

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How to
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the signs of
electricity
in the elec-
trometer
permanent.

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How to dis-
tinguish the
two electri-
cities.

In order to observe the electricity of the atmosphere with this instrument, we must first bring the electric fluid contained in the electrometer to the same degree of density with that at the surface of the earth; this is easily done by letting the bottom and top touch the ground at the same time; then raise the point, keeping the bottom still in contact with the ground, from whence it may be lifted up in a vertical position till the balls are level with the eye.

The second circumstance is to render the divergence of the balls, which is occasioned by the electricity of the air, permanent. This is effected by touching the top of the electrometer with the finger: but here the acquired electricity becomes contrary to that of the body by which they are electrified. Let us suppose, for example, that the electrometer is at five feet from the ground, and the balls diverging; touch the top of the electrometer with the finger, and the balls will close; but they will again open if the electrometer is withdrawn from the influence of the electricity of the air, by being brought nearer the ground, or into the house. M. Sauffure only employed this method when the electricity was so weak that he could not perceive any until the electrometer was raised considerably above his eye: as in this case he could not perceive the divergence of the balls, he always endeavoured to obtain a permanent electricity in the foregoing manner.

To know whether the balls separate with positive or negative electricity, bring a piece of excited wax gradually near the top of the electrometer; if the balls separate further on the approach of the wax, they are negatively electrified, or of the same nature with the electricity of the wax; if on the other hand they come nearer together on the approach of the wax, then the electricity is positive, or in a contrary state to that of the wax. If glass is used, the results will be exactly the reverse of the preceding.

The following example will render the use of the foregoing observations more familiar. Choose an open situation free from trees and houses, screw the conductor on the top of the electrometer, lay hold of it by its base, and place it so that the base and conductor may touch the ground at the same time; then elevate it to the height of the eye, and observe the quantity of lines, or fourths of a line, that the balls have diverged; now lower it till the balls almost touch each other, and observe at what distance the top of the conductor is from the ground; and this is the height from the ground at which the electricity of the air begins to be sensible. If the electricity of the air is sufficiently strong to make the balls diverge when it

N^o 113.

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stands upon the ground, one of the lengths of the electrometer must be unscrewed from it. If the balls however still diverge, the other parts of the conductor should also be unscrewed, and you may mark down, that the electricity is sensible at zero, or on the surface of the earth. If, on the contrary, the electricity is so weak, as not to cause the balls to diverge when they are even with the eye, and consequently when the conductor is two feet higher, or seven feet from the ground, you should then raise it a foot higher; while it is thus elevated, touch the top with the other hand; when this hand is taken away, lower the electrometer, and if it is electrified you may say the electricity is sensible at eight feet; if it is not, raise it as high as the arm can reach, and repeat the same operation; if any electricity is found, write down electricity sensible at nine feet; if not, mark 0, or no electricity relative to this instrument, and this mode of employing it; for signs of electricity may still be obtained, by throwing a metallic ball 50 or 60 feet into the air, which is at the same time connected with the electrometer by a metallic thread.

One advantage of this instrument is, that it will often exhibit signs of electricity when none can be obtained from a conductor of 100 feet in height, because it can more easily be preserved from humidity, &c. which destroy the insulation of the large conductors.

Aerial electricity varies according to the situation; it is generally strongest in elevated and insulated situations, not to be observed under trees, in streets, in houses, or any inclosed places; though it is sometimes to be found pretty strong on quays and bridges. It is also not so much the absolute height of the places as their situation; thus a projecting angle of a high hill will often exhibit a stronger electricity than the plain at the top of the hill, as there are fewer points in the former to deprive the air of its electricity.

The intensity of the atmospheric electricity is varied by a great many circumstances, some of which may be easily accounted for, others with more difficulty. When the weather is not serene, it is impossible to assign any rule for their variation, as no regular correspondence can then be perceived with the different hours of the day, nor with the various modifications of the air. The reason is evident; when contrary and variable winds reign at different heights, when clouds are rolling over clouds, these winds and clouds, which we cannot perceive by any exterior sign, influence however the strata of air in which we make our experiments, produce these changes of which we only see the result, without being able to assign either the cause or its rela-

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measuring
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&c.

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Observations on atmospheric electricity.

substance whose electricity is to be explored, will diminish the tension or repulsive force of this substance; and the quantity diminished by the contact of the ball will give the ratio of the capacity of this substance with that of the ball. Let us suppose a Leyden phial uninsulated, but so concealed, that only the knob is visible, and we are therefore ignorant of its size, and the strength of the shock it will give. Let the top of M. Sauffure's electrometer be in contact with the knob of the bottle, and the balls of the electrometer separate 6 lines, — from this solitary fact, we shall gain no information relative to the force of the shock; because, if the jar is very large, this degree of tension will give a very painful sensation; when, if it is very small, with the same indicated tension, the sensation may be almost imperceptible. But if we bring a ball of a foot diameter, in contact with the knob of the bottle, and after having thus taken a part of the fluid therefrom, the electrometer is again put in contact with the knob thereof, the remaining quantity of repulsive force will show the relation between its contents and that of the globe of metal, and by this means the intensity of its charge.

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measuring
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&c.

relation. Thus, in stormy weather, we see the electricity strong, then null, and in a moment after arise to its former force; one instant positive, the next negative, without being able to assign any reason for these changes. M. Saussure says, that he has seen these changes succeed with such rapidity, that he had not time to note them down.

When rain falls without a storm, these changes are not so sudden; they are, however, very irregular, particularly with respect to the intensity of force; the quality thereof is more constant. Rain or snow almost uniformly gives positive electricity.

In cloudy weather, without rain or storms, the electricity follows generally the same laws as in serene weather.

Strong winds generally diminish its intensity; they mix together the different strata of the atmosphere, and make them pass successively towards the ground, and thus distribute the electricity uniformly between the earth and the air. M. Saussure has observed a strong electricity with a strong north wind.

The state of the air in which the electricity is strongest, is foggy weather: this is always accompanied with electricity, except when the fog is going to resolve into rain.

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A periodical
flux and
reflux ob-
servable in
the electri-
city of the
atmo-
sphere.

The most interesting observations, and those which throw the greatest light upon the various modifications of electricity in our atmosphere, are those that are made in serene weather. In winter (during which most of M. Saussure's observations were made), and in serene weather, the electricity was generally weakest in an evening, when the dew had fallen, until the moment of the sun's rising: its intensity afterwards augmented by degrees, sometimes sooner and sometimes later; but generally before noon, it attained a certain maximum, from whence it again declined, till the fall of the dew, when it would be sometimes stronger than it had been during the whole day; after which, it would again gradually diminish during the whole night; but it is never quite destroyed, if the weather is perfectly serene.

Atmospherical electricity seems, therefore, like the sea, to be subject to a flux and reflux, which causes it to increase and diminish twice in 24 hours. The moments of its greatest force are some hours after the rising and setting of the sun; those when it is weakest, precede the rising and setting thereof.

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M. Saussure's ob-
servations
on this sub-
ject in an
extraordi-
nary de-
gree of
cold.

M. Saussure has given an instance of this periodical flux in electricity: On the 22d of February 1785, (one of the coldest days ever remembered at Geneva), the hygrometer and thermometer were suspended in the open air on a terrace exposed to the south-west; the electrometer, from its situation, indicated an electricity equal to what it would have shown if it had been placed on an open plain. The height of the barometer was reduced to what it would have been if the mercury had been constantly at the temperature of 10 degrees of Reaumur's thermometer. The place of observation was elevated 60 feet above the level of the lake. The observations of the day preceding and following this great cold were marked down by him; because it is pleasing to have these which precede and follow any singular phenomena. There was a weak S. W. wind during the whole three days; and it is ra-

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ther remarkable, that most of the great colds, which have been observed at Geneva, were preceded by, or at least accompanied with, a little S. W. breeze.

From the first 18 observations made during these three days, when the sky was quite serene, we learn that the electricity was pretty strong at nine in the morning; that from thence it gradually diminished till towards six in the evening, which was its first minimum; after which it increased again till eight, its second maximum; from whence it again gradually declined till six the next morning, which was the time of its second minimum; after which, it again increased till ten in the morning, which was the first maximum of the following day; as this was cloudy, the electric periods were not so regular.

The electricity of serene weather is much weaker in summer than in winter, which renders it more difficult to observe these gradations in summer than in winter; besides a variety of accidental causes, which at the same time render them more uncertain. In general, in summer, if the ground has been dry for some days, and the air is dry also, the electricity increases from the rising of the sun till three or four in the afternoon, when it is strongest; it then diminishes till the dew begins to fall, which again reanimates it; tho' after this it declines, and is almost extinguished during the night.

But the serene days that succeed rainy weather in summer, generally exhibit the same diurnal periods or states of electricity, as are to be observed in winter.

The air is invariably positive in serene weather, both in winter and summer, day and night, in the sun or in the dew. It would seem, therefore, that the electricity of the air is essentially positive; and that whenever it appears to be negative, in certain rains or in storms, it probably arises from some clouds, which have been exposed to the pressure of the electric fluid contained in the upper part of the atmosphere, or to more elevated clouds that have discharged a part of their fluid upon the earth, or upon other clouds.

In order to find out the cause of these phenomena, M. Saussure instituted a set of experiments on evaporation, avoiding the use of M. Volta's condenser.

To produce a strong evaporation, he threw a mass of red-hot iron into a small quantity of water, which was contained in a coffee-pot with a large mouth, and suspended by silk strings; by this he obtained a strong positive electricity; though, according to M. Volta's system, it ought to have been negative: the experiment was repeated several times, varying some of the circumstances, but the result was always the same.

As it was not easy to think so able a philosopher as M. Volta was deceived, it was necessary to try the experiment in a manner more analogous to that of M. Volta. A small chafing-dish was therefore insulated by silk cords, and the coffee-pot, with a small quantity of water, placed on it; one electrometer was connected with the coffee-pot and another with the chafing-dish; the fire was raised by a pair of bellows; when the water had boiled strongly for a few minutes, both electrometers exhibited signs of electricity, which, on examination, was found to be negative; proving the truth of M. Volta's experiment.

3 T

The

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measuring
Electricity,
&c.

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Of the
maximum
and mini-
mum of the
electricity
of the at-
mosphere
on this oc-
casion.

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Electricity
weaker in
summer
than in
winter.

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Air always
positively
electrified.

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Saussure's
experi-
ments to
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of the phe-
nomena of
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tricity

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&c.

The evaporation produced by the effervescence of iron in the vitriolic acid, and by that of chalk in the same acid, gave also negative electricity.

It was now necessary to inquire, why the vapour, excited by the heated iron, produced positive electricity; while that from boiling water in any other way produced a negative electricity?

M. Saussure suspected, that the intensity of heat to which the water is exposed, by the contact of a body in a state of incandescence, was the cause of the electricity produced by its evaporation; and that a combination was then formed, by which a new quantity of the electric fluid was produced. This conjecture may at first sight seem improbable; but the quantity of electricity produced by this experiment will astonish those that repeat it: and this quantity is the more surprising, because, if it is true, according to the system of M. Volta, that the waters absorb, while they are forming a quantity of the electric fluid, there must, therefore, be enough developed in this experiment for the formation of the great quantity of vapours produced by the heated iron, and afterwards a sufficient quantity to electrify strongly the apparatus, and all these vapours.

This experiment shows clearly the cause of that prodigious quantity of electricity which is unfolded in the eruption of volcanos; as it is probable that the water in these, from many circumstances, acquires a much greater degree of heat than is given to it in our experiments.

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Positive
electricity
always pro-
duced by
the com-
bustion of
iron.

To verify this conjecture, that it was in some measure the combustion of the water or the iron that produced the positive electricity, it was proper to try whether, by a regular moderation of the heat of the iron, positive electricity would always be obtained. This was essayed in the following manner: A large iron crucible, five inches high, four in diameter, and six lines thick, was heated red hot, then insulated; after which, small quantities of water were thrown into it, each projection of the water cooling more and more the crucible; thus descending by degrees till there was only sufficient heat to boil the water; carefully observing, and then destroying, the electricity produced at each projection. The electricity was always positive or null; at the first projections it was very strong; it gradually diminished to the twelfth, when it was scarce sensible, though always with a tendency to be positive.

On repeating this experiment, and varying it in different ways, a remarkable circumstance was observed: When a small quantity of water was thrown into the crucible, the moment it was taken from the fire, while it was of a pale red, approaching what is called the

204.
Water e-
vaporates
more slow-
ly on a
red-hot
metal than
on one
heated to
a lesser de-
gree.

white heat, no electricity was obtained. This fact seemed to have some connection with another mentioned by Musschenbroek, that water evaporates more slowly on a metal, or any other incandescent body, than on the same body, heated only a small degree above boiling water. To examine this relation, and to find whether there was any between the periods of evaporation and the production of electricity, M. Saussure made a great number of experiments, which are most accurately described in his work; but as the detail would be much too long, we

shall only present the reader with the heads thereof, and a description of the apparatus.

The apparatus consisted of a pot of clay, well baked or annealed, 15 lines thick and 4 inches diameter; this was insulated by a dry glass goblet; upon this pot was placed the crucible, or any other heated substance on which the water was to be thrown, in order to be reduced into vapour; the crucible was contiguous to a wire connected with an electrometer; a measure, containing 54 grains weight of distilled water, was thrown upon the heated crucible: the time employed in the evaporation thereof was observed by a second watch; the electricity produced by this evaporation was noted. When this measure of water was reduced into vapour, the electricity of the apparatus is destroyed, and a fresh measure of water is thrown into the crucible, proceeding in the same manner till the crucible is almost cold.

The first experiment was with an iron crucible, from which it was found that Musschenbroek was not right in saying that the evaporation was slowest when the iron was hottest; for at the instant it was taken from the fire, it required 19 seconds to evaporate the water, and took more time till the third projection, when it took 35 seconds, though from that period it employed less time, or in other words, the evaporation accelerated in proportion as the iron cooled.

With respect to the electricity, it was at first 0, then positive, afterwards negative, then 0, and afterwards positive to the end of the experiment. The vapour was not visible till the 7th projection.

In the second experiment with the same crucible, though every endeavour was made use of to render them as similar as possible, the electricity was constantly positive.

The third experiment was with a copper crucible: here also the electricity was positive; and the longest time employed in evaporation was not the instant of the greatest heat. It was very curious to see the water endeavouring to gather itself into a globule, like mercury on glass, to be sometimes immovable, and then to turn on itself horizontally, with great rapidity; sometimes throwing from some of its points a little jet, accompanied with an hissing noise.

The fourth experiment was with the same crucible; the electricity was at first negative, then constantly positive.

The fifth was with a crucible of pure silver: a considerable time was employed here in evaporating the same quantity of water; even in the instant of the greatest heat it took 5 minutes 6 seconds; the electricity was weak; three times no electricity was perceived; five times negative electricity was discovered.

In a sixth experiment with the same crucible, a positive electricity was obtained at the second projection, after which none of any kind was perceived.

The seventh with the same, gave at first a strong negative electricity; the second and third projection gave a weak positive electricity.

The eighth was made with a porcelain cup: here the evaporation was slower at the second than the first projection; but from this it took longer time till it was cold.

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Electricity,
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Apparatus
for making
the experi-
ments.

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Experi-
ments with
this appa-
ratus.

Methods of cold, contrary to what happened with the metals; the measuring electricity was always negative. The ninth and tenth experiments with the same cup produced similar effects.

The eleventh experiment was with spirits of wine in a silver crucible: there was no electricity produced at the two first projections, and what was afterwards obtained was negative.

Twelfth experiment with ether: here the electricity was also negative. These two inflammable fluids, in evaporating, followed the same laws as water, being dissipated at first most rapidly in the greatest heat, afterwards taking a longer and longer time before they were evaporated to a certain period, then employing less time, or evaporating quicker, till the crucible was nearly cold.

Now as china and silver always produced negative electricity, while iron and copper have generally given positive electricity, we may conclude, that electricity is positive with those bodies that are capable of decomposing water, or of being decomposed themselves by their contact with the water; and negative with those which are not at all decomposed or altered.

From hence M. Saussure conjectures, that the electric fluid may be looked upon as formed by the union of fire with some unknown principle, perhaps a fluid analogous to inflammable air, but exceedingly more subtle. This analogy seems to him sufficiently proved by the inflammation of the electric fluid, and by the diminution of the air in which this inflammation is made. Though many doubts have been attempted to be thrown on this inflammation, there seems to be one reason which forces us to admit it, which is the loss of a quantity of this fluid at every spark; we may diminish at pleasure any quantity of this fluid by taking a number of sparks from it. From whence also it may be inferred, that a considerable quantity is destroyed every day by thunder.

According to this system, when the operation, which converts water into vapour, produces at the same time a decomposition, it then generates the electric fluid. A part of this fluid combines itself immediately with these vapours, and serves even to form them. The vessel in which this operation is performed, will acquire a positive electricity, none at all, or a negative, according as the quantity of the fluid generated is superior, equal, or inferior to that which the formation of the vapour consumes. When no decomposition accompanies the evaporation, the electricity ought to be constantly negative, because there is nothing to replace the quantity of this fluid which is employed in forming the vapour.

If in the foregoing experiments, those substances which were susceptible of calcination had constantly given a positive electricity, and those which do not calcine had always given the negative, every thing would have been explained by these principles, and they would thence have acquired a greater degree of probability: but the phenomena have not always followed this law. We have seen iron and copper sometimes give a negative electricity, and silver the positive. The first case is not difficult to account for; it is well known with what facility iron and copper calcine in a brisk fire; they become covered with a scaly crust,

which is not susceptible of any further alteration with the same heat. If the bottom of the crucible acquires this crusty coating, the drop of water placed thereon will be no longer in contact with a calcinable substance; there will be no farther decomposition, no generation of the electric fluid: the vapours, however, which are still formed, will absorb a part of the fluid naturally contained in the apparatus, and this will therefore be electrified negatively. If some of the scales should be so far detached, that the water may gain some points of contact, the quantity thus generated may compensate for what is absorbed by the vapours, and thus the electricity will be null. If more are detached, it will superabound and be positive. For the same reasons, a large mass of water, by attacking the iron in a greater number of points, always gives positive electricity; and hence, also, a strong positive electricity is obtained, by throwing a piece of red-hot iron into a mass of water.

It is not so easy to explain why silver gives sometimes a positive electricity, but by supposing it to have been mixed with some substances capable of calcination; and this the more, as the white porcelain always gave negative electricity. This supposition was verified by some subsequent experiments, in which the same silver, when purified, always gave a negative electricity.

M. Saussure owns himself incapable of explaining why heated charcoal always gives negative electricity; unless it can be attributed to the promptitude with which so rare a substance loses its heat by the contact of water.

One fact astonished him, namely, that by combustion properly so called, although it is an evaporation, the highest degree of evaporation, he never obtained any signs of electricity, though he tried to obtain it in a variety of ways. Probably the current produced by the flame disperses and dissipates the electricity as soon as it is formed. The case, however, must not be looked upon as general, because M. Volta obtained signs of electricity from bodies in combustion by means of his condenser.

Another singular fact was, his not being able to obtain electricity without ebullition, though he endeavoured to compensate by the quantity of surface for the quantity of vapours that were elevated by boiling water; and indeed, the same quantity of water, if extended over too large a surface, will not give any electricity.

But of all the instruments by which it hath been attempted to measure electricity, none have been found to answer the purpose equally well with that invented by Mr Bennet, of which an account is given in the 77th volume of the Philosophical Transactions, and which is represented fig. 64. It consists of two slips of leaf gold, *a a*, suspended in a glass cylinder *b*. The foot *c* may be made of wood or metal, and the cap *d* of metal; the latter being made flat at top for the convenience of putting any thing upon it that is to be electrified. The cap is about an inch wider than the diameter of the glass, and its rim about three quarters of an inch broad, hanging parallel to the glass to keep it sufficiently insulated, and to turn off the rain. Within this is another circular rim about half as broad as the former, lined with silk or velvet, so that

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Saussure's
conjecture
concerning
the nature
of the e-
lectric
fluid.

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Consequen-
ces of M.
Saussure's
system.

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Observa-
tions up-
on it.

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No signs
of electri-
city to be
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Mr Ben-
net's elec-
trometer
described.

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it may be made to fit the outside of the glass exactly, while the cap may be easily taken off to repair any accident happening to the gold-leaf. From the centre of the cap hangs a tin tube somewhat longer than the depth of the inner rim, in which a small peg *f* is placed, which may be taken out occasionally. To this peg, which is rounded at one end and flat at the other, two slips of leaf-gold are fastened with paste, gum-water, or varnish. These are about a fifth-part of an inch broad, and two inches long, tapering to a sharp point. In one side of the cap is a small tube *g*, to place wires in: *h h* are two long pieces of tin-foil fastened with varnish on opposite sides of the internal surface of the glass, where the leaf-gold may be expected to strike, and in connection with the foot. The upper end of the glass is covered and lined with sealing-wax as low as the outermost rim, to make the insulation more perfect. An improvement on this electrometer is to make the cylinder pretty long, and to have a small additional tube of gum-lac on the end of it. The slips of tin-foil reach almost to the edge of the outer rim, and are sharp pointed at top; widening in the middle, and decreasing in breadth again as they descend.

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Its extreme
sensitivity.

The sensibility of this electrometer is extreme, as appears from the following examples.

1. On putting powdered chalk into a pair of bellows, and blowing it upon the cap, the latter was electrified positively when the nozzle of the bellows was about six inches from it; but at the distance of three feet from the nozzle, the same stream electrified it negatively. Thus it appears that the electricity may be changed from positive to negative from the mere circumstance of the wider diffusion of this stream of chalk in the air. It may also be changed by placing a bunch of fine wire, silk, or feathers, in the nozzle of the bellows; and it is likewise negative when blown from a pair of bellows without their iron-pipe, so that it may come out in a larger stream: but this last experiment was found to answer best in wet weather. There is likewise a remarkable difference between the experiment in which the electricity is positive and that in which it is negative; the former being communicated with some degree of permanency to the cap, so that the gold-leaf continues for some time to diverge; but the latter being only momentary, and the gold-leaf collapsing as soon as the cloud of chalk is dispersed. The reason why the former continues is, that the chalk sticks to the cap.

2. A piece of chalk drawn over a brush, or powdered chalk put into the brush, and projected upon the cap, electrifies it negatively; but its electricity is not communicated.

3. Powdered chalk blown with the mouth or bellows from a metal plate placed upon the cap, electrifies it permanently positive. Or if the chalk is blown from the plate, either insulated or not, so that the powder may pass over the cap, if not too far off, it is also positive. Or if a brush is placed upon the cap, and a piece of chalk drawn over it, when the hand is withdrawn, the leaf gold gradually opens with positive electricity as the cloud of chalk disperses.

4. Powdered chalk falling from one plate to another placed upon the instrument, electrifies it negatively.

Other methods of producing electricity with chalk

and other powders have been tried; as projecting chalk from a goose wing, chalking the edges of books and clapping the book suddenly together, also sifting the powder upon the cap; all which electrified it negatively: but the instrument being placed in a dusty road, and the dust struck up with a stick near it, electrified it positively. Breaking the *glass-tear* upon a book electrified it negatively, but when broken in water it did not electrify it.

Wheat-flour and red-lead are strongly negative in all cases where the chalk is positive. The following powders were like chalk: red ochre and yellow rosin, coal ashes, powdered crocus metallorum, aurum mosaicum, black-lead, lampblack (which was only sensible in the two first methods), powdered quick-lime, umber, lapis calaminaris, Spanish brown, powdered sulphur, flowers of sulphur, iron-filings, rust of iron, sand. Rosin and chalk, separately alike, were changed by mixture; this was often tried in dry weather, but did not succeed in damp: white lead also sometimes produced positive and sometimes negative electricity when blown from a plate.

If a metal cup be placed upon the cap with a red-hot coal in it, a spoonful of water thrown in electrifies the cap negatively; and if a bent wire be placed in the cap, with a piece of paper fastened to it to increase its surface, the positive electricity of the ascending vapour may be tried by introducing the paper into it. Perhaps the electrification of fogs and rain is well illustrated by pouring water through an insulated cullender, containing hot coals, where the ascending vapour is positive and falling drops negative.

The sensibility of this electrometer may be considerably increased by placing a candle upon the cap. By this means, a cloud of chalk, which in the other case only just opens the leaf-gold, will cause it to strike the sides for a long time together; and the electricity, which was not before communicated, now passes into the electrometer, causing the leaf-gold to repel after it is carried away. Even sealing-wax by this means communicates its electricity at the distance of 12 inches at least, which it would scarcely otherwise do by rubbing upon the cap.

A cloud of chalk or wheat flower may be made in one room, and the electrometer with its candle be afterwards leisurely brought from another room, and the cloud will electrify it before it comes very near. The air of a room adjoining to that wherein the electrical machine was used, was very sensibly electrified, which was perceived by carrying the instrument through it with its candle.

In very clear weather, when no clouds were visible, the electrometer has been often applied to the insulated string of kites without metal, and their positive electricity caused the leaf-gold to strike the sides; but when a kite was raised in cloudy weather with a wire in the string, and when it gave sparks about a quarter of an inch long, the electricity was sensible by the electrometer at the distance of ten yards or more from the string; but when placed at the distance of six feet, the leaf-gold continued to strike the sides of the electrometer for more than an hour together, with a velocity increasing and decreasing with the density or distance of the unequal clouds which passed over.

Sometimes the electricity of an approaching cloud

has

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Consider-
ably aug-
mented by
means of a
lighted
candle.

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Its applica-
tion to e-
lectrical
kites.

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Other experiments, showing the great sensibility of this electrometer.

has been sensible without a kite, though in a very unfavourable situation for it, being in a town surrounded with hills, and where buildings encompassed the wall on which the electrometer was placed. A thunder-cloud passing over, caused the leaf-gold to strike the sides of the glass very quick at each flash of lightning.

No sensible electricity is produced by blowing pure air, projecting water, by smoke, flame, or explosions of gunpowder.

A book was placed upon the cap, and struck with silk, linen, woollen, cotton, parchment, and paper, all which produced negative repulsion; but when the other side of the book was struck with silk, it became positive; this side, struck at right angles with the former, was again negative; and by continuing the strokes which produced positive, it changed to negative for a little while; and, by stopping again, became positive. No other book would do the same, though the sides were scraped unchalked, upon a supposition that altering the surface would produce it. At last, one side of a book was moistened, which changed it; whence it was concluded, that one edge of the book had lain in a damp place; which conjecture was farther confirmed by all the books becoming positive in damp weather, and one of them being dried at the fire again became negative.

When the cap is approached with excited sealing-wax, the leaf-gold may be made to strike the sides of the glass more than twelve times; and as the sealing-wax recedes, it strikes nearly as often; but if it approaches much quicker than it recedes, the second number will sometimes be greater.

The quantity of electricity necessary to cause a repulsion of the leaf-gold is so small, that the sharpest point or edges do not draw it off without touching; hence it is unnecessary to avoid points or edges in the construction of this instrument.

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How to make experiments on the evaporation of water.

To the experiments on blowing powders from a pair of bellows it may be added, that if the powder is blown at about the distance of three inches upon a plate which is moistened or oiled, its electricity is contrary to that produced by blowing upon a dry plate. This shows that the electricity of the streams of powder issuing out of the bellows is only contrary to the more expanded part, because it is within the influence of its atmosphere; for when this is destroyed by the adhesion of the powder to the moistened plate, it is negative when the bellows are positive, as it was before positive when the more expanded cloud was negative. The experiments on evaporation of water may be tried with more ease and certainty of success by heating the small end of a tobacco-pipe, and pouring water into the head; which running down to the heated part, is suddenly expanded, and will show its electricity when projected upon the cap of the electrometer more sensibly than any other way that has been tried. If the pipe be fixed in a cloven stick, and placed in the cap of one electrometer whilst the steam is projected upon another, it produces both electricities at once. Spirit of wine and ether are electrified like water. Oil and vitriolic acid produced smoke without any change of electricity. In these experiments a long pipe is better than a short one.

Besides these instruments, there are several others invented by Mr Cavallo which answer the purpose of obser-

ving the electricity of the atmosphere extremely well, tho' not with such great accuracy as that just now described; and of which he gives the following account.

"Fig. 67. represents a very simple instrument for making experiments on the electricity of the atmosphere; and which, on several accounts, seems to be the most proper for that purpose. *AB* is a common jointed fishing-rod, without the last or smallest joint. From the extremity of this rod proceeds a slender glass tube *C*, covered with sealing-wax, and having a cork *D* at its end, from which a pith-ball electrometer is suspended. *HGI* is a piece of twine fastened to the other extremity of the rod, and supported at *G* by a small string *FG*. At the end (*I*) of the twine a pin is fastened; which when pushed into the cork *D*, renders the electrometer *E* uninsulated. When I would observe the electricity of the atmosphere with this instrument, I thrust the pin (*I*) into the cork *D*; and holding the rod by its lower end *A*, project it out from a window in the upper part of the house, into the air, raising the end of the rod with the electrometer, so as to make an angle of about 50° or 60° with the horizon. In this situation I keep the instrument for a few seconds; and then pulling the twine at *H*, the pin is disengaged from the cork *D*: which operation causes the string to drop in the dotted situation *KL*, and leaves the electrometer insulated, and electrified with an electricity contrary to that of the atmosphere. This done, I draw the electrometer into the room; and examine the quality of the electricity without obstruction either from wind or darkness. With this instrument I have made observations on the electricity of the atmosphere several times in a day for several months."

His electrometer for rain is shown Plate CLXXVII. fig. 70. and of this he gives the following description. "A *BCI* is a strong glass tube about two feet and a half long, having a tin funnel *DE* cemented to its extremity, which funnel defends part of the tube from the rain. The outside surface of the tube from *A* to *B* is covered with sealing-wax; so also is the part of it which is covered by the funnel. *FD* is a piece of cane, round which brass wires are twisted in different directions, so as to catch the rain easily, and at the same time to make no resistance to the wind. This piece of cane is fixed into the tube; and a slender wire proceeding from it goes through the bore of the tube, and communicates with the strong wire *AG*, which is thrust into a piece of cork fastened to the end *A* of the tube. The end *G* of the wire *AG* is formed in a ring, from which I suspend a more or less sensible pith-ball electrometer as occasion requires. This instrument is fastened to the side of the window-frame, where it is supported by strong brass hooks at *CB*; which part of the tube is covered with a silk lace, in order to adapt it better to the hooks. The part *FC* is out of the window, with the end *F* elevated a little above the horizon. The remaining part of the instrument comes through a hole in one of the lights of the sash within the room, and no more of it touches the side of the window than the part *CB*. When it rains, especially in passing showers, this instrument, standing in the situation above described, is frequently electrified; and, by the diverging of the electrometer, the quantity and quality of the electricity of the rain may be observed without any danger of a mistake. With this instrument I have observed,

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Mr Cavallo's instrument for observing the electricity of the atmosphere.

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His electrometer for rain.

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All these
instru-
ments im-
perfect.

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Mr Caval-
lo's differ-
tation on
measuring
small de-
grees of
electricity.

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Volta's
condenser.

served, that the rain is generally, though not always, electrified negatively; and sometimes so strongly, that I have been able to charge a small coated phial at the wire *AG*. This instrument should be fixed in such a manner that it may be easily taken off from the window and replaced again as occasion requires; for it will be necessary to clean it very often, particularly when a shower of rain is approaching."

Notwithstanding the great accuracy of these instruments, however, there are still many degrees of electricity too small to be observed by any of them. To be able to collect these, it is necessary to have one capable of retaining the electricity it receives for a considerable time, and of allowing it to accumulate till it becomes capable of being measured by some of the common methods. Upon instruments of this kind Mr Cavallo gives the following dissertation.

"Besides the way of ascertaining small quantities of electricity by means of very delicate electrometers, two methods have been communicated to the philosophical world, by which such quantities of electricity may be rendered manifest as could not be perceived by other means. The first of those methods is an invention of M. Volta, the apparatus for it being called the *condenser of electricity*, and is described in the Philosophical Transactions, Vol. LXXII. The second is a contrivance of the above-mentioned Mr Bennet, who calls the apparatus *the doubler of electricity*. A description of it is inserted in the Philosophical Transactions, Vol. LXXVII.

"M. Volta's condenser consists of a flat and smooth metal plate, furnished with an insulating handle, and a semiconducting, or imperfectly insulating, plane. When one wishes to examine a weak electricity with this apparatus, as that of the air in calm and hot weather, which is not generally sensible to an electrometer, he must place the above-mentioned plate upon the semiconducting plane, and a wire, or some other conducting substance, must be connected with the metal plate, and must be extended in the open air, so as to absorb its electricity; then, after a certain time, the metal plate must be separated from the semiconducting plane; and being presented to an electrometer, will electrify it much more than if it had not been placed upon the above-mentioned plane.

"The principle on which the action of this apparatus depends is, that the metal plate, whilst standing contiguous to the semiconducting plane, will both absorb and retain a much greater quantity of electricity than it can either absorb or retain when separate, its capacity being increased in the former and diminished in the latter case.

"Whoever considers this apparatus, will easily find, that its office is not to manifest a small quantity of electricity, but to condense an expanded quantity of electricity into a small space: hence, if by means of this apparatus one expected to render more manifest than it generally is, when communicated immediately to an electrometer, the electricity of a small tourmalin, or of a hair when rubbed, he would find himself mistaken.

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Mr Bennet's doubler ob-
jected to.

"It is Mr Bennet's doubler that was intended to answer that end; viz. to multiply, by repeated doubling, a small, and otherwise unperceivable, quantity of elec-

tricity, till it became sufficient to affect an electrometer, to give sparks, &c. The merit of this invention is certainly considerable; but the use of it is far from precise and certain.

"This apparatus consists of three brass plates, which we shall call *A*, *B*, and *C*; each of which is about three or four inches in diameter. The first plate *A* is placed upon the gold-leaf electrometer, or it may be supported horizontally by any other insulating stand, and its upper part only is thinly varnished. The second plate *B* is varnished on both sides, and is furnished with an insulating handle, which is fastened laterally to the edge of it. The third plate *C* is varnished on the under side only, and is furnished with an insulating handle, which is perpendicular to its upper surface.

"This apparatus is used in the following manner. The plate *B* being laid upon the plate *A*, the small quantity of electricity, which is required to be multiplied, is communicated to the under part of the plate *A*, and at the same time the upper part of *B* is touched with a finger; then the finger is first removed; the plate *B* is afterwards removed from over the plate *A*. The plate *C* is now laid upon *B*, and its upper surface is touched, for a short time, with a finger. By this operation it is clear, that if the electricity communicated to the plate *A* is positive, the plate *B* must have acquired a negative electricity, and the plate *C* must have acquired the positive, viz. the same of the plate *A*. Now the plate *B*, being separated from *C*, is laid as before upon *A*; the edge of *C* is brought into contact with the under part of the plate *A*, and at the same time the upper part of *B* is touched with a finger; by which means the plate *B*, being acted upon by the atmospheres of both the plates *A* and *C*, will acquire nearly twice as much electricity as it did the first time, and of course will render the plate *C*, when that is laid upon it, proportionably more electrified than before: thus, by repeating this operation, the electricity may be increased to any required degree.

"The varnish on those surfaces of the plates which are to lie contiguous to each other, serves to prevent the metal of one touching the metal of the other; for in that case, instead of one plate causing a contrary electricity in the other, the electricity of the first would be gradually communicated to the others, and would be dissipated.

"As soon as I understood the principle of this contrivance, I hastened to construct such an apparatus, in order to try several experiments of a very delicate nature, especially on animal bodies and vegetables, which could not have been attempted before, for want of a method of ascertaining exceedingly small quantities of electricity; but after a great deal of trouble, and many experiments, I was at last forced to conclude, that the doubler of electricity is not an instrument to be depended upon, for this principal reason, viz. because it multiplies not only the electricity which is willingly communicated to it from the substance in question; but it multiplies also that electricity which in the course of the operation is almost unavoidably produced by accidental friction; or that quantity of electricity, however small it may be, which adheres to the plates in spite of every care and precaution.

"Having found, that with a doubler constructed in the above-described manner, after doubling or multiplying

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tipling 20 or 30 times, it always became strongly electrified, though no electricity had been communicated to it before the operation, and though every endeavour of depriving it of any adhering electricity had been practised; I naturally attributed that electricity which appeared after repeatedly doubling, to some friction given to the varnish of the plates in the course of the operation. In order to avoid entirely this source of mistake, or at least of suspicion, I constructed three plates without the least varnish, and which, of course, could not touch each other, but were to stand only within about one-eighth of an inch of each other. To effect this, each plate stood vertical, and was supported by two glass sticks, which were covered with sealing-wax. These were inserted into a wooden pedestal $7\frac{1}{2}$ inches long, $2\frac{1}{2}$ broad, and $1\frac{1}{4}$ th inch thick, being kept fast by cement both to the pedestal and likewise to another piece of wood fastened to the back of the plate. The plate itself is of strong tin, and measures about eight inches in diameter. The stand projects very little before the plate; by which means, when two of those plates are placed upon a table facing each other, the wooden stands will prevent their coming into actual contact.

"I need not describe the manner of doubling or of multiplying with those plates; the operation being essentially the same as when the plates are constructed according to Mr Benner's original plan, excepting that, instead of placing them one upon the other, mine are placed facing each other; and in performing the operation they are laid hold of by the wooden stand *AB*; so that no friction can take place either upon the glass legs or upon any varnish; for these plates have no need of being varnished. Sometimes, instead of touching the plates themselves with the finger, I have fixed a piece of thin wire to the back of the plate, and have then applied the finger to the extremity of the wire, suspecting that some friction and some electricity might possibly be produced when the finger was applied in full contact to the plate itself.

"It is evident, that as the plates do not come so near to each other in this as they do in the other construction, the electricity of one of them cannot produce so great a quantity of the contrary electricity in the opposite plate: hence, in this construction, it will be necessary to continue the operation of doubling somewhat longer; but this disadvantage is more than repaid by the certainty of avoiding any friction.

"Having constructed those plates, I thought that I might proceed to perform the intended experiments without any further obstruction: but in this I found myself quite mistaken; for on trying to multiply with those new plates, and when no electricity had been previously communicated to any of them, I found, that after doubling 10, 15, or at most 20 times, they became so full of electricity as to afford even sparks. All my endeavours to deprive them of electricity proved ineffectual. Neither exposing them, and especially the glass sticks, to the flame of burning paper, nor breathing upon them repeatedly, nor leaving them untouched for several days, and even for a whole month, during which time the plates remained connected with the ground by means of good conductors, nor any other precaution I could think of, was found capable of depriving them of every vestige of electricity; so that

they might show none after doubling 10, 15, or at most 20 times.

"The electricity produced by them was not always of the same sort; for sometimes it was negative for two or three days together; at other times it was positive for two or three days more; and often it changed in every operation. This made me suspect, that possibly the beginning of that electricity was derived from my body, and being communicated by the finger to the plate that was first touched, was afterwards multiplied. In order to clear this suspicion, I actually tried those plates at different times, viz. before and after having walked a great deal, before and after dinner, &c. noting very accurately the quality of the electricity produced each time; but the effects seemed to be quite unconnected with the above mentioned concomitant circumstances; which independence was further confirmed by observing that the electricity produced by the plates was of a fluctuating nature, even when, instead of touching the plates with the finger, they had been touched with a wire, which was connected with the ground, and which I managed by means of an insulating handle.

"At last, after a great variety of experiments, which it is unnecessary to describe, I became fully convinced, that those plates did always retain a small quantity of electricity, perhaps of that sort with which they had been last electrified, and of which it was almost impossible to deprive them. The various quality of the electricity produced was owing to this, viz. that as one of those plates was possessed of a small quantity of positive electricity, and another was possessed of the negative electricity, that plate which happened to be the most powerful, occasioned a contrary electricity in the other plate, and finally produced an accumulation of that particular sort of electricity.

"Those observations evidently show, that no precise result can be obtained from the use of those plates; and of course, that when constructed according to the original plan, they are still more equivocal, because they admit of more sources of mistake.

"As those plates, after doubling or multiplying only four or five times, show no signs of electricity, none having been communicated to them before, I imagined that they might be useful so far only, viz. that when a small quantity of electricity is communicated to any of them in the course of some experiment, one might multiply it with safety four or five times, which would even be of advantage in various cases; but in this also my expectations were disappointed.

"Having observed, after many experiments, that, *ceteris paribus*, when I began to multiply from a certain plate, which we shall call *A*, the electricity which resulted was generally positive; and when I began with another plate *B*, viz. considered this plate *B* as the first plate, the resulting electricity was generally negative; I communicated some negative electricity to the plate *A*, with a view of destroying its inherent positive electricity. This plate *A* being now electrified negatively, but so weakly as just to affect an electrometer, I began doubling; but after having doubled three or four times, I found, by the help of an electrometer, that the communicated negative electricity in the plate was diminished instead of being increased; so that sometimes it vanished entirely, though by continuing the operation

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tion it often began to increase again, after a certain period. This shows, that the quantity of electricity, which however small it may be, remains in a manner fastened to the plates, will help either to increase or to diminish the accumulation or multiplication of the communicated electricity, according as it happens to be of the same or of a different nature.

"After all the above mentioned experiments made with those doubling or multiplying plates, we may come to the following conclusion, viz. that the invention is very ingenious, but their use is by no means to be depended upon. It is to be wished that they may be improved so as to obviate the weighty objections that have been mentioned; the first desideratum being to construct a set of such plates as, when no electricity is communicated, they will produce none after having performed the operation of doubling for a certain number of times.

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Cavallo's
opinion of
the me-
thods by
which
small quan-
tities of
electricity
can be
measured.

"Upon the whole, the methods by which small quantities of electricity may be ascertained with precision are, as far as I know, only three. If the absolute quantity of electricity be small and pretty well condensed, as that produced by a small tourmalin when heated, or by a hair when rubbed, the only effectual method of manifesting its presence, and ascertaining its quality, is to communicate it immediately to a very delicate electrometer, viz. a very light one, that has no great extent of metallic or of other conducting substance; because if the small quantity of electricity that is communicated to it be expanded throughout a proportionably great surface, its elasticity, and of course its power of separating the corks of an electrometer, will be diminished in the same proportion.

"The other case is, when one wants to ascertain the presence of a considerable quantity of electricity, which is dispersed or expanded into a great space, and is little condensed, like the constant electricity of the atmosphere in clear weather, or like the electricity which remains in a large Leyden phial after the first or second discharge.

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His appa-
ratus for
this pur-
pose.

"To effect this, I use an apparatus, which in principle is nothing more than M. Volta's condenser; but with certain alterations, which render it less efficacious than in the original plan, but at the same time render it much less subject to equivocal results. I place two of the above described tin-plates upon a table, facing each other, and about $\frac{1}{8}$ th of an inch asunder. One of those plates, for instance *A*, is connected with the floor by means of a wire, and the other plate *B* is made to communicate, by any convenient means, with the electricity that is required to be collected. In this disposition the plate *B*, on account of the proximity of the other plate, will imbibe more electricity than if it stood far from it, the plate *A* in this case acting like the semiconducting plane of M. Volta's condenser, though not with quite an equal effect, because the other plate *B* does not touch it; but yet, for the very same reason, this method is incomparably less subject to any equivocal result. When the plates have remained in the said situation for the time that

N^o 111.

may be judged necessary, the communication between the plate *B* and the conducting substance which conveyed the electricity, must be discontinued by means of a glass stick, or other insulating body; then the plate *A* is removed, and the plate *B* is presented to an electrometer, in order to ascertain the quality of the electricity; but if the electrometer be not affected by it, then the plate *B* is brought with its edge into contact with another very small plate, which stands upon a semiconducting plane, after the manner of M. Volta's condenser (N); which done, the small plate, being held by its insulating handle, is removed from the inferior plane, and is presented to the electrometer: and it frequently happens, that the small plate will affect the electrometer very sensibly, and quite sufficient for the purpose; whereas the large plate itself showed no clear signs of electricity.

"If it be asked, why I use the semiconducting plane for this small plate, and not for the large one? the answer is, first, because the large semiconducting plane is incomparably more difficult to be procured than the small one; and, secondly, because the small plane may be easily deprived of any accidental electricity which may adhere to it; but the large one is more difficultly rendered fit for the purpose, especially as the large plate ought in general to remain upon it a much longer time than the small plate is to remain upon its semiconducting plane.

"The third and last case is, when the electricity to be ascertained is neither very considerable in quantity nor much condensed; such is the electricity of the hair of certain animals, of the surface of chocolate when cooling, &c. In this case the best method is to apply a metal plate, furnished with an insulating handle, like an electrophorus plate, to the electrified body, and to touch this plate with a finger for a short time whilst standing in that situation; which done, the plate is removed, and is brought near an electrometer; or its electricity may be communicated to the plate of a small condenser, as directed in the preceding case, which will render the electricity more conspicuous. It is evident, that in this case the metal plate will acquire the electricity contrary to that of the substance in question: but this answers the same purpose; for if the electricity of the plate be found to be positive, one must conclude, that the electricity of the body in question is negative, and contrariwise. In this operation, care must be had not to put the metal plate too near, or in full contact with the substance to be examined, lest the friction, likely to happen between the plate and the body, should produce some electricity, the origin of which might be attributed to other causes.

"Having thus far described the surest methods of ascertaining the presence and quality of electricity, when its quantity or degree of condensation is small, I shall now beg leave to add some farther remarks on the subject of electricity in general, and which have been principally suggested by what has been mentioned.

"On the hypothesis of a single electric fluid, it is said, that every substance in nature, when not electrified

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(N) This small plate is nearly of the size of a shilling, and the semiconducting plane is of wood covered with copal varnish.

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Every substance electrified at all times.

is proportionate to its bulk, or to some other of its properties; and it is generally believed, that this equal or proportionate distribution of electric fluid takes place with the greatest part of natural bodies. However, the fact is far from being so; and I may venture to assert, that, strictly speaking, every substance is always electrified, *viz.* that every substance, and even the various parts of the same body, contain at all times more or less electric fluid than that quantity of it which it ought to contain, in order to be in an electrical equilibrium with the bodies that surround it.

"At first sight it may be thought quite immaterial to know, whether the electric fluid is dispersed in the just proportion among the various substances which are not looked upon as electrified, or whether it deviates in a small degree from that proportionate distribution; but it will hereafter appear, that one of those assertions will lead us to the explanation of an interesting phenomenon in electricity, whereas the other does not admit of it; besides, what is called a small difference of the proportionate distribution, inasmuch as it does not affect our instruments, may be sufficient for several operations of nature, which it is our interest to investigate.

"If we inquire what phenomena evince this altered distribution, or the actually electrified state of all bodies, the preceding observations will furnish some very unequivocal ones; especially that of the doubling plates made after my plan, which showed to be electrified even after having remained untouched for a whole month, during which time they had been in communication with the ground; for if each of them had contained an equal share of electric fluid, the electric atmosphere of one of them could not possibly occasion a contrary electricity in the other, and consequently no accumulation of that power could have happened.

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Experiment showing the truth of this doctrine.

"A great number of instances are related in books on the subject of electricity, and in the *Phil. Transf.* of pieces of glass, of sulphur, of sealing-wax, &c. having remained electrified so far as to affect an electrometer for months after they had been excited, or even touched; but the following experiment will show, in a clearer manner, the great length of time that a quantity of electricity will remain upon a body.

"Having constructed a gold-leaf electrometer in the nicest manner I could, and which, on account of the non-conducting nature and construction of its upper part, could remain sensibly electrified for several hours together, I communicated some electricity to it, which caused the slips of gold-leaf to diverge with a certain angle; and as the electricity was gradually dissipated, the divergency diminished in the same proportion. Now, whilst this diminution of divergency was going on, I looked through a small telescope, and, by means of a micrometer, measured the chords of the angles of divergency, setting down the time elapsed between each pair of contiguous observations; and as the chord of the angle of divarication is in the direct simple proportion of the density of the electric fluid (A), I could by this means know how much electric fluid was lost by the electrometer in a certain time, and of course

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what portion of the electricity first communicated to the electrometer still remained in it. Let us make the chord of the angle of divarication on first electrifying the electrometer, or rather when first observed, equal to 16; or let us conceive that quantity of electricity to be divisible into 16 equal parts.

"I observed, that, when the chord of the angle became equal to eight, the time elapsed between this and the first observation was one minute; when the chord became equal to four, the time elapsed between this point and the preceding observation was 3' 30"; when the chord became equal to two, the time elapsed since the preceding observation was 17'; and when the chord became equal to one, the time elapsed since the preceding observation was one hour and a quarter; after which the electrometer remained sensibly electrified for a long time.

"In repeating this experiment, the times elapsed between the corresponding observations did not follow strictly the same proportion of increase; nor did they increase regularly in the same experiments, which may be attributed in great measure to the inaccuracy in observing, and to the fluctuating state of the air; but it could be safely inferred from all the experiments, that the times required for the dispersion of the electricity were at least greater than the inverse duplicate proportion of the densities of the electricity remaining in the electrometer. And if we imagine, that they continue to diminish in the same proportion of increasing time, which is far from being an extravagant supposition, we shall find, by a very easy calculation, that about two years after the electrometer would still retain the $\frac{1}{100}$ th part of the electricity communicated to it in the beginning of the experiment; and as we do not know how far a quantity of electricity is divisible, or to what extent it may be expanded, we may conclude with saying, that strictly speaking the electrometer would remain electrified for many years.

"It may be inferred from this, as well as from many other experiments, that the air, or in general any substance, is a more or less perfect conductor of electricity, according as the electricity which is to pass through it is more or less condensed; so that if a given quantity of electric fluid be communicated to a small brass ball, one may take it away by simply touching the ball with a finger; but if the same quantity of electric fluid be communicated to a surface of about 100 or 1000 square feet, the touching with the finger will hardly take away any part of it.

"If it be asked, what power communicates the electricity, or originally disturbs the equilibrium of the natural quantity of electric fluid in the various bodies of the universe? we may answer, that the fluctuating electric state of the air, the passage of electrified clouds, the evaporation and condensation of fluids, and the friction arising from divers causes, are perpetually acting upon the electric fluid of all bodies, so as either to increase or diminish it, and that to a more considerable degree than is generally imagined.

"I shall conclude, with briefly proposing an explanation of the production of electricity by friction, which is dependent upon the above stated proposition,

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viz.

(A) This proposition was first ascertained by F. Beccaria. See *Philosophical Transactions*, Vol. LVI.

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viz. that bodies are always electrified in some degree; and likewise upon the well known principle of the capacity of bodies for holding electric fluid being increased by the proximity of other bodies in certain circumstances.

"It seems to me, that the cylinder of an electrical machine must always retain some electricity of the positive kind, though not equally dense in every part of its surface; therefore, when one part of it is set contiguous to the rubber, it must induce a negative electricity in the rubber. Now, when, by turning the cylinder, another part of it (which suppose to have a less quantity of positive electricity than the preceding) comes quickly against the rubber; the rubber being already negative, and not being capable of losing that electricity very quickly, must induce a stronger positive electricity in the former part which is now opposite to it: but this part cannot become more positively electrified, unless it receives the electric fluid from some other body, and therefore some quantity of electric fluid passes from the lowest part of the rubber to this part of the glass; which additional quantity of electric fluid is retained by it alone only whilst it remains in contact with the rubber; for after that, its capacity being diminished, the electric fluid endeavours to escape from it. Thus we may conceive how every other part of the glass acquires the electric fluid, &c. and what is said of the cylinder of an electrical machine may, with proper changes, be applied to any other electric and its rubber."

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Cavallo's
instrument
for obser-
ving small
quantities
of electri-
city.

An instrument for observing very small quantities of electricity has likewise been invented by the same author, and described in the second part of the volume just quoted. The properties of this machine, which from its office may be called a collector of electricity, are, *first*, that when connected with the atmosphere, the rain, or in short with any body which produces electricity slowly, or which contains that power in a very rarefied manner, it collects the electricity, and afterwards renders both the presence and quality of it manifest, by communicating it to an electrometer. *2dly*, This collecting power, by increasing the size of the instrument, and especially by using a second or smaller instrument of the like sort to collect the electricity from the former, may be augmented to any degree. *3dly*, It is constructed, managed, and preserved with ease and certainty; and it never gives, nor can it give, an equivocal result, as he has proved experimentally, and as will appear by considering its construction.

Plate CLXXXVIII. exhibits two perspective views of this collector. Fig. 93. shows the instrument in the state of collecting the electricity; and fig. 94. shows it in the state in which the collected electricity is to be rendered manifest. An electrometer is annexed to each. The letters of reference indicate the same parts in both figures.

ABCD is a flat tin plate, 13 inches long and 8 inches broad; to the two shorter sides of which are soldered two tin tubes *AD* and *BC*, which are open at both ends. *DE* and *CF* are two glass sticks covered with sealing-wax by means of heat, and not by dissolving the sealing-wax in spirits. They are cemented into the lower apertures of the tin tubes, and also in the wooden bottom of the frame or machine at *E* and *F*; so that the tin plate *ABCD* is supported by those glass sticks in a vertical position, and is exceedingly

well insulated. *GHILKM* and *NOPV* are two frames of wood, which being fastened to the bottom-boards by means of brass hinges, may be placed so as to stand in an upright position and parallel to the tin-plate, as shown in fig. 94. or they may be opened, and laid upon the table which supports the instrument, as shown in fig. 93. The inward surfaces of those frames from their middle upwards are covered with gilt paper *XY*; but it would be better to cover them with tin-plates hammered very flat. When the lateral frames stand straight up, they do not touch the tin-plate; but they stand at about one-fifth part of an inch asunder. They are also a little shorter than the tin-plate, in order that they might not touch the tin-tubes *AD*, *BC*. In the middle of the upper part of each lateral frame is a small flat piece of wood *S* and *T*, with a brass hook; the use of which is to hold up the frames without the danger of their falling down when not required, and at the same time it prevents their coming nearer to the tin-plate than the proper limit. It is evident, that when the instrument stands as shown in fig. 94. the gilt surface of the paper *XY*, which covers the inside of the lateral frames, stands contiguous and parallel to the tin-plate.

When the instrument is to be used, it must be placed upon a table, a window, or other convenient support; a bottle electrometer is placed near it, and is connected, by means of a wire, with one of the tin tubes *AD*, *BC*; and by another conducting communication the tin-plate must be connected with the electrified substance, the electricity of which is required to be collected on the plate *ABCD*: thus, for instance, if it be required to collect the electricity of the rain or of the air, the instrument being placed near a window, a long wire must be put with one extremity into the aperture *A* or *B* of one of the tin-tubes, and with the other extremity projecting out of the window. If it be required to collect the electricity produced by evaporation, a small tin pan, having a wire or foot of about six inches in length, must be put upon one of the tin-tubes, so that, the wire going into the tube, the pan may stand about two or three inches above the instrument. A lighted coal is then put into the pan, and a few drops of water poured upon it will produce the desired effect. Thus far may suffice with respect to the mechanical description of the instrument: the power and use of it will be made apparent by the following experiments.

1. Communicate to the tin-plate *ABCD* a quantity of electricity, for instance, as much as would very sensibly affect a common cork-ball electrometer; then, if the lateral frames *GHM*, *NOP*, stand upright, as in fig. 94. the electrometer *W* will show no divergency; but if the frames are opened and let down, as in fig. 93. the balls of the electrometer *W* will immediately repel each other, and by the approach of an excited piece of sealing-wax, the quality of the electricity may be easily ascertained after the usual manner. Put up the lateral frames again, and the electricity will apparently vanish; let them down, and the electricity will re-appear, and so on. If you touch any part of the tin-plate or tin-tubes with your finger, the electricity is thereby entirely removed, and that will be the case whether the lateral frames are up or down.

2. Take

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2. Take an extended piece of tin-foil, about four yards square, and, holding it by a silk thread, electrify it so weakly as not to be capable of affecting an electrometer; then bring it in contact with the tin-plate of the collector, whilst the lateral frames are up. This done, remove the tin-foil, let down the lateral frames one after the other; and on doing this the electrometer *W* will immediately manifest a considerable degree of electricity. But if the electrometer were to show no sensible degree of electricity, a smaller collector, viz. one having a tin-plate of about four square inches, must be brought into contact with the tin-plate of the large collector, whilst the lateral frames of the latter only are down; and then the small collector being removed from the large one, its lateral frames are opened, and its tin-plate is presented to an electrometer, which will thereby be electrified to a much greater degree than the electrometer *W* was by the large collector.

3. Let a common cork-ball electrometer be fastened to an insulated conductor, having about two or three square feet of surface, and communicate to it such a quantity of electricity as may be sufficient to let the balls of the electrometer stand at about one inch asunder. In this state bring the conductor in contact with the tin-plate of the collector for a very short time, and it will be found, that the balls of its electrometer will immediately approach and touch each other, showing that the electricity of the conductor is gone to the plate of the collector; and, in fact, if you let down the lateral frames, the balls of the electrometer *W* will immediately repel each other to a very great degree.

It seems, therefore, to be clearly shown by these experiments, that the tin-plate of this instrument can collect and retain a vast quantity of electricity, when the conducting surfaces of the lateral frames are contiguous to it, in comparison to that quantity which it can either collect or retain when those surfaces are removed from its vicinity.

The quantity of electricity which the tin-plate *ABCD* is capable of collecting, principally depends on three circumstances, viz. 1st, on the distance between the tin-plate and the conducting lateral surfaces; the smaller that distance is, the greater being the collecting power: 2dly, on the size of the instrument: and, 3dly, on the quantity of electricity possessed by the body from which it must be collected or taken away.

The principle upon which the action of this instrument depends, is the same as that of the electrophorus of M. Volta's condenser, and of many other electrical experiments; namely, that a body has a much greater capacity for holding electricity when its surface is contiguous to a conductor which can easily acquire the contrary electricity, than when it stands not in that situation.

Plate
CLXXV.
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Electrical
air thermo-
meter.

The electrical air thermometer, fig. 34. is an instrument designed to show the power of electricity by its rarefaction of the air through which the fluid passes. But though this instrument in theory might be supposed capable of manifesting the very least degrees of electricity, the rarefaction of the air by its means is so very small, that unless the power of electricity be very considerable, no expansion will be perceived. The instrument, however, certainly has its

uses, and many curious experiments may be performed with it. *AB* represents a glass cylinder having a brass cap, with a wire and knob passing through it, and which is cemented on the open part of the glass. The under part is inverted into a small dish *BC*, containing quicksilver or some other liquid, which may rise in the small tube *AH* by any expansion of the air in the cylinder *AB*. *CD* is an insulating stand, which serves to sustain the whole; *E* is an hook by which a communication may be made to the ground; and *F* another for connecting the whole with the prime conductor of an electrical machine. The discharges of electricity made by the sparks between the knobs *G* and *I* expand the air, and force up the fluid into the small tube *AH*; and its rise there is marked upon a graduated scale. This instrument will likewise answer for showing the diminution or increase of any kind of air by the electric spark, as well as its sudden expansion by a spark or shock of a phial. Mr Morgan has shown that the mercury in a common thermometer, if well made, may be raised by the electric blast.

In a treatise lately published by the Reverend Mr Abraham Bennet, he gives an account of the machine called the *doubler of electricity*, with some improvements upon it by Mr Nicholson; by which means the machine becomes less liable to the objections of Mr Cavallo above-mentioned. In its improved state, it consists of two insulated and immovable plates about two inches in diameter, and a moveable plate also insulated, which revolves in a vertical plane parallel to the two immovable plates, passing them alternately.

"The plate *A* is constantly insulated, and receives the communicated electricity. The plate *B* revolves; and when it is opposite the plate *A*, the connecting wires at the end of the cross piece *D* must touch the pins of *A* and *C* at *EF*, and a wire proceeding from the plate *B* must touch the middle piece *G*, which is supported by a brass, wooden, or other conducting pillar in connection with the earth. In this position, if electricity be communicated to the plate *A*, the plate *B* will acquire a contrary state; and passing forwards, the wires also moving with it by means of the same insulating axis, the plates are again insulated till the plate *B* is opposite to *C*, and then the wire at *H* touches the pin in *C*, connecting it with the earth, and communicating the contrary state of electricity to that of *B*, but of the same kind with that of *A*. By moving the handle still further, *B* is again brought opposite to *A*; and the connecting wires joining *A* and *C*, they both act upon *B*, which is connected with the earth as before, and nearly double its intensity, whilst the electricity of *C* is absorbed into *A*; because of the increased capacity of *A*, whilst opposed to *B*, capable by its connection with the earth of acquiring a contrary state sufficient to balance the influential atmospheres of both plates.

"Thus by continuing to revolve the plate *B*, the process is performed in a very expeditious and accurate manner.

"The ball *I* is made heavier on one side than the other, and screwed upon the axis opposite to the handle, to counterbalance the plate *B*, which may therefore be stopped in any part of its revolution.

"Yet notwithstanding the convenience and accuracy of this doubler, it always produced spontaneous electricity,

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Mr Ben-
net's doub-
ler of elec-
tricity im-
proved by
Nicholson.

Plate
CLXXVI.
Fig. 65.

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&c.

city, even after all the resinous substances used in its construction had been melted over a candle, and after standing a long time with its plates in connection with the earth. I therefore conjectured that this spontaneous electricity was not owing to accidental friction, but to the increased capacity of approximating parallel plates which might attract and retain their charge tho' neither of them were insulated. To prove my hypothesis, I first endeavoured more effectually and speedily to deprive the instrument of the electricity last communicated, and that I might know whether this spontaneous charge, supposed to arise from the increased capacity of the parallel plates, would be always of the same kind.

"To effect this deprivation, I connected the plates *A* and *C* together by a wire hooked at each end upon two small knobs on the backs of the plates, the middle of the same wire touching the pillar which supports the doubler. Another wire was hooked at one end upon the back of the plate *B*, and at the other end to the brass ball which counterbalances this plate. Thus all the plates were connected with the earth; and by turning the handle of the doubler, it might be discharged of electricity in every part of its revolution.

"After often trying this method of depriving the doubler, I observed that its spontaneous charge was almost always negative. I then touched *A* and *C* with a positively charged bottle, and turned the doubler till it produced sparks for a long time together; and after this strong positive charge, I hooked on the wires as above, and revolved the plate *B* about 100 times, which so deprived the doubler of its positive electricity, that when the wires were taken off, it produced a negative charge at about the same number of revolutions which it required before.

"The positively charged bottle was again applied; and the wires being hooked upon the plates as before, *B* was revolved only 50 times; yet this was found sufficient to deprive it of its positive charge, and in many experiments 5 or 6 revolutions were sufficient: but I never thought it safe to stop at so few, and have therefore generally turned the handle 40 or 50 times between every experiment.

"Left electricity adhering to the electrometer should obstruct the above experiments, I did not let it stand in contact with the doubler during its revolutions, but touched the plate *A* with the cap of the electrometer, after I supposed its electricity was become sufficiently sensible: but lest even this contact should communicate any electricity, I made a cap for my electrometer of shell-lac, having a small tin tube in the centre, to which the gold leaf was suspended within the glass, and a bent wire was fixed to the top, which might easily be joined to the plate *A* of the doubler; and thus the gold-leaf was more perfectly insulated, and the electricity could not be diffused over so large a surface. The glass which insulates the plates and cross piece of the doubler was also covered with shell-lac."

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Nicholson's
instrument
for distin-
guishing
the two
electricities.

Fig. 66. shows an instrument invented by Mr Nicholson for distinguishing the two electricities from one another. *A* and *B* are two metallic balls placed at a greater or less distance from each other by means of the joint at *C*; the two branches *CA* being made of varnished glass. From one of the balls *B* proceeds a short point towards the other ball *A*. If the two be

placed in the course or current of the electric matter, so that it may pass through the air from one to the other, its direction will be known. For if the electric matter pass from *A* to *B*, there will be a certain distance of the balls dependent on the strength of electricity, within which the dense sparks will pass from the point; but if its course be in the contrary direction, no spark will be seen, unless the balls be almost in contact with the point.

We shall conclude this section with some observations on the electrical kite; which perhaps may after all be found the only instrument that will certainly show the electricity of the atmosphere upon all occasions. The use of it, however, is very troublesome, as it obliges the observer always to go abroad, which sometimes must be disagreeable. By means of the apparatus represented fig. 72. this inconvenience may be avoided. *AB* represents the string of the kite, insulated by means of the silk cord *C*, tied about the foot of a table in the room where the experiments are to be made. This string passes out through a window of the room, and supports the kite; the electricity being conveyed by means of a small wire to the insulated conductor *D*, having a quadrant electrometer applied to it, as in the figure. *G* is a glass tube about 18 inches long, with a brass wire and knob proceeding from it; by taking a small spark with which from the conductor, the quality of the electricity may be observed.

Fig. 68. 69. represent a pocket electrometer, which may be very conveniently used when the atmospheric electricity is collected in any quantity. The case or handle of this electrometer is formed by a glass tube about three inches long and $\frac{1}{10}$ ths of an inch in diameter, half of which is covered with sealing-wax. From one extremity of this tube, viz. that without sealing-wax, a small loop of silk proceeds, which serves occasionally to hang the electrometer on a pin, &c. To the other extremity of the tube a cork is adapted, which, being cut tapering on both ends, can fit the mouth of the tube with either end. From one extremity of this cork two linen threads proceed, a little shorter than the length of the tube, suspending each a little cone of pith of alder. When this electrometer is to be used, that end of the cork which is opposite to the threads is pushed into the mouth of the tube; then the tube forms the insulated handle of the pith electrometer, as represented fig. 69. But when the electrometer is to be carried in the pocket, then the threads are put into the tube, and the cork stops it as represented fig. 68. The peculiar advantages of this electrometer are, its convenient small size, its great sensibility, and its continuing longer in good order than any other. Fig. 68. represents a case to carry the above described electrometer in. This case is like a common toothpicks-case, except that it hath a piece of amber fixed on one extremity *A*, which may occasionally serve to electrify the electrometer negatively; and on the other extremity it hath a piece of ivory fastened upon a piece of amber *BC*. This amber *BC* serves only to insulate the ivory; which when insulated, and rubbed against woollen cloths, acquires a positive electricity, and is therefore useful to electrify the electrometer positively.

In making experiments with the kite, it is sometimes necessary to act with caution, on account of the

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Observa-
tions on the
use of the
electrical
kite.

Plate
CLXXVII.

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A conveni-
ent pocket
electrome-
ter.

Methods of measuring Electricity, &c. 233 Experiments with the kite sometimes dangerous.

the great quantity of electricity collected by it. Of this we have already given some instances, to which we shall add the following from Mr Bennet; viz. that having on the 5th of July 1788 raised a kite with 200 yards of string, when it had been flying about an hour, a dark cloud appeared at a great distance, and changed the electricity from positive to negative. The electric power increased till the cloud became nearly vertical, when some large drops of rain fell; and our author attempting to secure the string from wet, received such a strong shock in his arm, as deprived it for a few seconds of sensation. The explosion was heard at the distance of about 40 yards, like the loud crack of a whip.

SECT. XI. Of the Effects of Electricity on Vegetation.

It is a very considerable time since electricians began to make experiments on this subject; and it was generally agreed that the electric fluid was favourable to the growth of vegetables. For a long time, however, such researches seem to have been laid aside; nor indeed did it seem very probable that any quantity of the fluid could be collected artificially sufficient to be of use. But in a late treatise the subject has been revived by the Abbe Bertholon; who not only shows a method of collecting the fluid from the atmosphere so as to be useful in ordinary practice, but endeavours to cure by means of this fluid some of those diseases to which plants are liable from insects, and which cannot be removed by any of the ordinary remedies.

234 The upper parts of the atmosphere always abound with electric matter.

"In the first place (says the Abbé), there is continually and every where diffused in the atmosphere (particularly in the upper regions) a considerable quantity of the electric fluid. On the mountains especially, it is always felt with most energy, and shows itself in greater abundance than on the plains. On the former, if you erect conductors, or launch electric paper-kites, in order to seek out and direct this fluid towards the surface of the earth, where several causes sometimes prevent its appearance; you will find it very soon subjected to your power, descend, as if at your command, from heaven itself, and creep at your feet to execute your orders. These are facts extremely well ascertained; but if one doubts of them, he has nothing to do but to erect a similar apparatus or set off electric kites to be convinced of the truth. These will immediately and at all times obtain an electricity so much the more strong as the height of the apparatus shall be the more considerable. Being informed, that in England this experiment was tried with the most convincing effect, I mention it, as it has hitherto not been published. Upon a high mountain there were launched two electric paper-kites, one of which was fixed to the inferior extremity of the other, thus gaining a double advantage in point of height; the consequence of which was, that the electric effects were incomparably greater than those produced by a single instrument. But I suppose it entirely useless to insist longer upon a fact so well demonstrated and universally admitted.

235 Electro-vegetometer described.

"This principle being granted: in order to remedy the deficiency of electric fluid which has already been proved to be hurtful to vegetation, we must erect in the spot which we want to fecundate the following new apparatus, which has had all possible suc-

cess, and which I shall call by the name of the *electro-vegetometer*. This machine is as simple in its construction as efficacious in its manner of acting; and I doubt not but it will be adopted by all those who are sufficiently instructed in the great principles of nature.

"This apparatus is composed of a mast *AB* (Plate CLXXX. fig. 82.), or a long pole thrust just so far into the earth as to stand firm and be able to resist the winds. That part of the mast which is to be in the earth must be well dried at the fire; and you must take care to lay on it a good coat of pitch and tar after taking it from the fire, that the resinous particles may enter more deeply into the pores of the wood, which will then be dilated, at the same time that its humidity will be expelled by the heat. Care must likewise be taken to throw around that part fixed in the earth a certain quantity of coal-dust, or rather a thick layer of good cement, and to build besides a base of masonry-work of a thickness and depth proportionable to the elevation of the instrument, so as to keep it durable and solid. As to the portion of it above the ground, it will be sufficient to put upon it some coats of oil-paint, except one chooses rather to lay on a coat of bitumen the whole length of the piece.

"At the top of the mast there is to be put an iron-console or support *C*; whose pointed extremity you are to fix in the upper end of the mast, while the other extremity is to terminate in a ring, in order to receive the hollow glass-tube which is seen at *D*, and in which there is to be glued an iron rod rising with the point *E*. This rod, thus pointed at its upper extremity, is completely insulated, by reason of its keeping a strong hold of a thick glass-tube, which is filled with a quantity of bituminous matter, mixed with charcoal, brick-dust, and glass-powder; all together forming a sufficiently good and strong cement for the object in view.

To prevent rain wetting the glass tube, care must be taken to solder to the rod *E* a funnel of white-iron; which consequently is entirely insulated. From the lower extremity of the rod *E* hangs a chain *G*, which enters into a second glass-tube *H*, supported by the prop *I*. The lower end of the above-mentioned chain rests upon a circular piece of iron-wire, which forms a part of the horizontal conductor *KLMN*. In *L* is a breaker with a turning joint or hinge, in order to move to the right or left the iron-rod *LMN*; there is likewise another in *Q*, to give still greater effect to the circular movement. *O* and *P* are two supports terminating in a fork, where there is fixed a filken cord tightly stretched, in order to insulate the horizontal conductor: in *N* are several very sharp iron-points.

236 Another form of this instrument.

"In fig. 83. you see an apparatus in the main like the former, but with some difference in the construction. At the upper extremity of the mast *ab* there is bored a hole into which enters a wooden cylinder *c*, which has been carefully dried before a great fire, in order to extract its humidity, dilate its pores, and saturate it with tar, pitch, or turpentine, applied at repeated intervals. The more heat the wood and bituminous matter receives, the more the substance penetrates, and the insulation will be the more complete. It is moreover proper to besmear the circumference of the little cylinder with a pretty thick coat of bitumen. This preparation being made, we next insert the cylinder *c*

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tion.

into the hole *b* of the mast; and it is easy to join together these two wooden pieces in the most perfect manner.

"At the upper extremity of the cylinder *c* we strongly attach an iron-rod *gf*; which, instead of one, is terminated by several sharp points all of gilded iron. In *e* you see a branch of iron resembling the arm of an iron-crow, from whence hangs an iron chain *bi*, at the end of which there is hooked a piece of iron resembling a mason's square, and ending in a fork. The piece of iron *l* is a ring with a handle entering a little into the glass-tube *m* filled with mastiche, in the same manner as does the iron-rod *n*. The conductor *po* is to be considered as an additional piece to act in that marked *p*. There are likewise put iron-spikes in *q*: the support *s* resembles those of *O* and *P* in the former figure. In this new machine you can lengthen or shorten the horizontal conductor as you please; and as the iron-ring *l* turns freely in a circular gorge made in the mast, the conductor is enabled to describe the entire area of a circle.

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Effects of
these instru-
ments.

"The construction of this *electro-vegetometer* once well understood, it will be easy for us to conceive its effects. The electricity which prevails in the aerial regions will soon be drawn down by the elevated points of the upper extremity. This effect of the points is proved by the most decisive experiments, and is called by philosophers the *power of the points*.

"The electric matter brought down by the point *E*, or by those marked *fff*, will be necessarily transmitted both by the rod and chain; because the insulation produced at the upper extremity of the mast completely prevents its communication with the timber. The electric fluid passes from the chain to the horizontal conductor *KM* or *no*: it then escapes by the points at *P* and *q*; because the same points that have the power of bringing down the electric fluid, have likewise that of pushing it forward; a thing well known by experience.

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Method of
using them.

"The manner of using this instrument is not more difficult than the knowledge either of its conductor or effects. Suppose, for example, we are to place it in the midst of a kitchen-garden. By making the horizontal conductor turn round successively, you will be able to carry the electricity over the whole surface of the proposed ground. The electric fluid thus drawn down, will extend itself over all the plants you want to cultivate; and this at a time when there is little or no electricity in the lower regions nigh the surface of the earth.

"On the other hand, when it happens that the electric fluid shall be in too great abundance in the atmosphere, in order to take off the effect of the apparatus in *K* fig. 82. and in *n* fig. 83. you have only to hang to it an iron chain reaching to the ground, or else a perpendicular iron-rod, which will have the same effect, *viz.* that of destroying the insulation, and of insensibly transmitting the electric fluid in the same proportion as it is drawn by the points; so that there shall never be an overcharge of this fluid in the instrument, and its effect shall be either something or nothing, according as you add or remove the second chain or the additional rod.

"There will be nothing to fear from the spontaneous discharge of this apparatus, because it is terminated

below by proper points in *P* and *q* of both machines; and it is a certain fact, that a pointed conductor makes no explosion, and that instead of flashes there are only luminous streams. However, it will be easy to furnish one, by means of which we may approach the apparatus with perfect security; it is only necessary to hold the hand before it. This has the form of a great C, and is of a height equal to the distance that takes place betwixt the horizontal conductor and the surface of the earth. This discharger near the middle must be furnished with a glass-handle; and at that extremity which is directed towards the conductor, there must hang an iron-chain made to trail on the ground. This instrument is an excellent safeguard. See fig. 84.

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Great ad-
vantages
to be ex-
pected from
these in-
struments.

"By means of the *electro-vegetometer* just now described, one may be able to accumulate at pleasure this wonderful fluid, however diffused in the regions above, and conduct it to the surface of the earth, in those seasons when it is either scantily supplied, or its quantity is insufficient for vegetation; or although it may be in some degree sufficient, yet can never produce the effects of a multiplied and highly increased vegetation. So that by these means we shall have an excellent vegetable manure or nourishment brought down as it were from heaven, and that too at an easy expence; for after the construction of this instrument, it will cost you nothing to maintain it: It will be moreover the most efficacious you can employ, no other substance being so active, penetrating, or conducive to the germination, growth, multiplication, or reproduction of vegetables. This heavenly manure is that which nature employs over the whole habitable earth; not excepting even those regions which are esteemed barren, but which, however, are often fecundated by those agents which nature knows so well to employ to the most useful purposes. Perhaps there was nothing wanting to bring to a completion the useful discoveries that have been made in electricity, but to show this so advantageous an art of employing electricity as a manure; consequently, that all the effects which we have already mentioned, depend upon electricity alone; and lastly, that all these effects, *viz.* acceleration in the germination, the growth, and production of leaves, flowers, fruit, and their multiplication, &c. will be produced, even at a time when secondary causes are against it: and all this is brought about by the electric fluid, which we have the art of accumulating over certain portions of the earth where we want to raise those plants that are most calculated for our use. By multiplying these instruments, which are provided at no expence (since iron-rods of the thickness of one's finger, and even less, are sufficient for the purpose), we multiply their beneficial effects, and extend their use *ad infinitum*.

"This apparatus having been raised with care in the midst of a garden, the happiest effects were perceived, *viz.* different plants, herbs, and fruits, in greater forwardness than usual, more multiplied, and of better quality. At the same time it was observable, that, during the night, the points *P* and *q*, as well as the upper extremities, were often garnished with beautiful luminous sparks. These facts are analogous to an observation which I have often made, *viz.* that plants grow best and are most vigorous near thunder-rods, where their situation favours their development. They

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Vegetation
most vigo-
rous near
thunder-
rods.
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likewise serve to explain why vegetation is so vigorous in lofty forests, and where the trees raise their heads far from the surface of the earth, so that they seek, as it were, the electric fluid at a far greater height than plants less elevated; while the sharp extremities of their leaves, boughs, and branches, serve as so many points granted them by the munificent hand of nature, to draw down from the atmosphere that electric fluid, which is so powerful an agent in forwarding vegetation, and in promoting the different functions of plants.

"This electro-vegetometer may be set up not only in a kitchen-garden, but in an orchard, in a field of corn, olive-yard, &c. &c. Everywhere the same effects are produced, namely, fecundity in the soil, quickness of vegetation, increase of produce, superiority in the quality, &c. This machine is applicable to all kinds of vegetable productions, to all places, and all seasons; and if I am to believe the most enlightened and intelligent of my friends, the electro-vegetometer is one of the most noble and useful discoveries that have been made in the present century.

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The elec-
tricity of
the air may
be thus de-
termined
by a large
electrome-
ter.

"Besides the advantages of the electro-vegetometer, of which we have been speaking above, there is still another very important one, namely, that by applying to it a large electrometer or grand conductor, we may thus find out the electricity of the atmosphere. For this purpose we must take away the points *HR* (fig. 82. and *r.* fig. 83.) which are seen in *Rr.* This machine will likewise serve the purpose of a thunder-rod, if one takes care to thrust into the earth, to the depth of about 10 or 15 feet, a leaden tube, whose upper extremity may rise a few inches above the surface of the ground; and into this tube you are to pass the long iron chain or perpendicular rod set apart for destroying the insulation, and whose upper end is to be hooked to a chain in *H*, fig. 82. or in *k*, fig. 83. These two chains are very strong, and are fit for serving as an excellent conductor. Or if you choose, you may substitute in their room webs of white thread, or iron-wires, which will make no difference in the effects of the apparatus. In the figures we have preferred chains, that the distinction of the different parts may be the more sensibly perceived. With these additions the electro-vegetometer will be as good a thunder-rod as any that are ordinarily constructed.

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How to
augment
the powers
of vegeta-
tion by ar-
tificial elec-
tricity.

"It is not only by means of the electricity in the atmosphere, collected by the above apparatus, that one can supply the electric fluid, which is so necessary to vegetation; but the electricity named *artificial* answers the same purpose. However astonishing the idea may be, or however impossible it may appear to realize it, yet nothing will be found more easy upon trial. Let us suppose that one wants to augment the vegetation of trees in a garden, orchard, &c. without having recourse to the apparatus destined to pump down as it were the electricity from the atmosphere, it is sufficient to have a large insulating stool. This may be made in two ways; either by pouring a sufficient quantity of pitch and melted wax upon the above stool, whose borders being more raised than its middle, will form a kind of frame; or more simply, the stool (which is likewise called the *insulator*) shall only be composed of a plate longer than

broad, supported by four glass-pillars, like those used for electrical machines. One must take care to place above the insulator a wooden tray full of water, and to cause mount upon the stool a man carrying a small pump in the form of a syringe. If you establish a communication between the man and an electrical machine put in motion (which is easily done by means of a chain that connects with the conductor of the machine), then the man thus insulated (as well as every thing upon the stool) will be able, by pushing forward the sucker, to water the trees, by pouring upon them an electrical shower; and thus diffusing over all the vegetables under its influence a principle of fecundity that exerts itself in an extraordinary manner upon the whole vegetable economy: and this method has moreover this advantage, that at all times and in all places it may be practised and applied to all plants whatever.

"Every one knows that the electricity is communicated to the water thus employed; and it would be easy to obtain the most ample conviction (if any one doubted it), by receiving upon his face or hand this electrical shower; he immediately feels small punctures or strokes, which are the effects of the sparks that issue from each drop of water. This is perceived most sensibly if there is presented a metal-dish to this electrical dew; for at the very instant of contact, brilliant flashes are produced.

"That the electricity received by the man from the chain may be communicated to the tray, we must put a small cake of white-iron, upon the end of which he may place his foot. The tray filled with water is a kind of magazine or reservoir to serve as a continual supply to the pump. After watering one tree, you transport the stool to a second, a third, and so on successively; which is done in a short time, and requires very little trouble.

"Instead of the chain, it is better to employ a cord or twist of pinchbeck or any other metal; by means of which there can be no loss of the electric matter, as there is in the case of the chain by the ring-points. Moreover, this metal cord or thread being capable of being untwisted and lengthened, there will be no occasion of transporting so often the electrical machine. It is almost needless to add, that this string or metallic chord, which is always insulated, may rest upon the same kind of supports with those which have been exhibited in *OP* and *s* of fig. 82. and 83. This method is simple, efficacious, and nowise expensive, and cannot be too much employed.

"If one wants to water either a parterre or com-
mon garden-beds and platforms of flowers, or any
other plots in which are sown grain or plants of diffe-
rent ages and kinds, no method is more easy and ex-
peditious than the following: Upon a small carriage
with two wheels there is placed a framed insulator in
form of a cake of pitch and rosin, as we have mentioned
before in fig. 82. The carriage is drawn the whole length
of the garden by a man or horse fixed to it. In propor-
tion as you draw the carriage, the metallic cord winds
itself upon a bobbin, which turns as usual. This last
is insulated, either because the little apparatus that
sustains the bobbin is planted in a mass of rosin (when
you choose the axle to be of iron), or else because
this

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tion.

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Easy me-
thod of ap-
plying elec-
tricity in
this man-
ner.

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tion.

this moveable axis is a tube of solid glass. There must also be a support, which serves to prevent the gold-thread or the metallic-cord from trailing on the ground, and thus dissipating the electricity; and, moreover, it serves as an insulator. To accomplish this last purpose, it is necessary that the ring into which it passes be of glass. One may likewise employ the insulators and supports marked *OP* and *s*, in fig. 82. and 83. If a gardener, mounted upon an insulator, holds in one hand a pump full of water, and with the other takes hold of a metallic-cord, in order to transmit the electricity which comes from the conductor; in this case, the water being electrified, you will have an electrical shower; which falling on the whole surface of the plants which you want to electrify, will render the vegetation more vigorous and more abundant. A second gardener is to give additional pumps full of water to him who is upon the insulator, when he shall have emptied those he holds; and thus in a little time you will be able to electrify the whole garden. This method takes hardly longer time than the ordinary one; and although it should be a little longer, the great advantages resulting from it will abundantly recompence the small additional trouble.

"By repeating this operation several days successively, either upon seed sown or plants in a state of growth, you will very soon reap the greatest advantages from it. This operation, equally easy with the preceding described upon the subject of watering trees, has been put in practice with the greatest success. Several other methods, answering the same purpose, might be devised; but they are all of them pretty similar to that just described.

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To electrify water kept in reservoirs, &c.

"I cannot finish this article without mentioning another method relative to the present object, although it be much less efficacious than the preceding ones. It consists in communicating to water kept in basons, reservoirs, &c. (for the purpose of watering), the electric fluid, by means of a good electrical machine. To this end, one must plaster over with a bituminous cement all the interior surface of the bason destined to receive the water that serves for irrigation: the nature of this cement answering the purpose of insulation, will prevent the electric fluid that communicates with the water from being dissipated; and the water thus charged with electricity will be the more fitted for vegetation.

"The method just now laid down of electrifying water for the purpose of watering trees is both easy and cheap; the expence of the cement being inconsiderable, as it requires but once to be done, and as it prevents the water from filtrating and being lost, as well as from hurting the walls themselves, which would otherwise have occasion to be oftener repaired; consequently you are sufficiently indemnified by its utility for all the trouble you take. A machine applied to the extremity of the axle of the electric apparatus might communicate to it a rotatory movement, and still further diminish the expence of the operation.

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Vegetables injured by the electric shock.

"If the deficiency of the electric fluid, or rather a small quantity of it, is apt to be hurtful to vegetables, a too great abundance of this matter will likewise sometimes produce pernicious effects. The experiments made by Messrs Nairne, Banks, and other learn-

N^o 114.

ed men of the Royal Society of London, prove sufficiently this truth. An electric battery, very strong, was discharged upon a branch of balsam still holding by its trunk. Some minutes after, there was observed a remarkable alteration in the branch, of which the less woody parts immediately withered, drooped towards the ground, died next day, and in a short time entirely dried up; at the same time that another branch of the same plant that had not been put under the electric chain, was not in the smallest degree affected.

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tion.

"This experiment repeated upon other plants showed the same effects; and it was remarked that the attraction, occasioned by a strong discharge of the electricity, produced an alteration different according to the different nature of the plants. Those which are less woody, more herbaceous, more aqueous, experience in proportion impressions that are stronger and much more speedy in their operation.

"A branch of each of the following plants, composing an electrical chain, it was observed by these able philosophers, that the balsam was affected by the discharge of the battery in a few moments after, and perished next day. The leaves of a marvel of Peru did not drop till the day following that; and the same phenomenon happened to a geranium. Several days elapsed before there was observed any fatal effect on the cardinal flower. The branch of a laurel did not show any symptoms till after the lapse of about 15 days, after which it died; but it was a full month before they perceived any sensible change on the myrtle; at the same time they constantly observed that the bodies of those plants and branches which had formed no part of the chain, continued to be fresh, vigorous, and covered with leaves in good condition.

"It hardly ever happens that the superabundance of the electric fluid existing in a small portion of the atmosphere where a plant is situated, can be so great as that which took place by the explosion of the strong battery of Mr Nairne, directed particularly upon one branch; or if this should happen, it can only be upon a few individual plants in very small number; as when lightning falls upon a tree, breaks it, strips it of its bark, or withers its leaves; or in the case of blasting or mildew in corn, which several farmers ascribe to the force of lightning. "This sentiment (says M. du Hamel) has acquired much probability since the discovery of the great effects of that electricity which is diffused so abundantly in the atmosphere when the weather is disposed to be stormy." (*Elemens d'Agric.* Tom. I. p. 346.)

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Blasting or mildew supposed to be owing to lightning.

"It is not proposed here to prescribe the means of remedying the pernicious effects which may be produced upon this occasion; as there are none of them in circumstances exactly similar to that of the experiments of the philosopher just now quoted. But although this enormous excess of the electric fluid of which we have been speaking, never takes place through any great extent of space, nevertheless this excess, though even but inconsiderable, may be too great in several respects regarding the vegetable economy; and it is in this case that it is proper to seek the means of remedying it.

"Let us suppose that one has some plants or shrubs,

or

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tion.

or some valuable trees or exotics that he wants to preserve, and is sensible that too great a quantity of electricity predominant in the atmosphere becomes hurtful to them, there are two methods that may serve to obviate the evil of which he is apprehensive. One is, to water plentifully these vegetables, so that their whole surface may be kept sufficiently wet; the consequence of which is, that the electricity prevailing in the atmosphere will be transmitted to the earth by the water adhering to the outside of the plants, as it is well known that water is an excellent conductor of the electric fluid: The other is, to place near these trees metallic points, which may be easily accomplished by simple lathes or wooden-poles; along which one must fasten by bandages plain iron-wires, so as to overtop them by some inches. These poles thus prepared, being thrust into the earth, will then draw down the electric fluid, and transmit it to the earth."

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Methods of
destroying
insects by
electricity.

Our author now proceeds to consider of methods of destroying the insects which frequently infest and destroy vegetables; which, he thinks, may be obtained by means of the electric fluid.

"Experience (says he) proves, that in years when vegetation is most vigorous and abundant, insects, if nothing opposes them, will then be most multiplied; and in fact they are sometimes so to an astonishing degree. How great mischief they produce on these occasions, every body knows, and as ardently desires to find a remedy for the calamity. The damage is indeed so considerable, that people imagine it is not possible by any means to put a stop to it; but I am of opinion, it is one of those evils to which electricity may be applied with effect.

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Mischief
done by ca-
terpillars
getting in-
to the heart
of twigs.

"It has been often remarked, that several species of worms or caterpillars are found in the heart of shoots, twigs, and even the trunks of trees, of shrubs, and of plants of different sorts. There are numbers, for example, in pear and other fruit trees. As soon as the animal has got to the inside of a branch, he forms a gallery according to the length of it: armed with strong scaly jaws, he soon reduces the woody substance to powder; and this same delicate caterpillar makes the wood, hard as it is, his favourite nourishment. Other insects generally show themselves in open day: but this one, like a pioneer, marches always in obscurity within; and we are apprised of his presence only by the mischief he produces, namely, by observing the tops of branches to wither, the leaves to fade and incline to the earth, and in fine the whole infected bough to decay and die away. In vain do you seek for this frail though terrible animal on the leaves; he enters the skin and penetrates the thickest bark of the surface; he goes even to the heart of the woody substance; and you can extirpate him only by cutting off the wood; and if this is a remedy, you must confess that it is at least equal to the mischief.

"This evil so much the more merits attention, that it extends itself particularly over a very great number of fruit-trees; in which, for the same reason, we are as particularly interested. Electricity, however, furnishes us with a remedy of the most efficacious sort to stop the progress of the evil, by attacking the enemy in his quarters, and destroying him in his own mine; which in this event is to become his tomb.

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"The Leyden phial, by the mere force of its shock, which can be augmented gradually, is capable of destroying not only rabbits and pigeons, but bulls and oxen, especially when we employ electrical batteries of great size, and containing a great number of electrified jars. Of consequence then it may be employed even with little apparatus to kill a tender and delicate caterpillar, which, in order to shelter itself from the impressions of the air, is obliged to keep perpetually shut up in the heart of trees, or in that of twigs, branches, or trunks themselves.

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Easily kill-
ed by an
electric
shock.

"In order to succeed in killing these animals at the time when they begin to show their ravages, which mark likewise the place where the caterpillar is concealed, it is sufficient to make an electric chain with two plain iron-wires, and to place betwixt the two that part of the tree where it is supposed the insect resides. One need not be afraid of taking in even a larger space, for the experiment will succeed as well in a great extent as in a small; and besides, one runs no risk of missing the enemy he wants to combat. Let us suppose, that one be assured from the forementioned symptoms, that there is an insect in the tree; in this case you place iron-wires above and below the place where you suspect it to be lodged. Next, you must take care to make the one communicate with the exterior surface of an ordinary jar charged with electricity, and the other with the interior surface, which it is easy to do by bending these iron-wires so as to make them approach the electrical jar; then upon discharging this vessel where the electric fluid superabounds, the explosion is made to traverse the part where the animal lodges: the violence of the shock makes him die without recovery, and so destroys the evil in its source. If the ravage has not been carried to a high pitch, the tree recovers very soon, as I have often observed: but whatever be the result as to the re-establishment in certain circumstances, the evil proceeds no further; its progress stops; and it is always a great advantage to have arrested it in its march.

"Several experiments have convinced me of the success of this method. Upon cutting off several branches on which I discharged my jar or Leyden bottle, I constantly observed the animal dead; and you never fail of killing it when the distance betwixt the two extremities of the iron-wires is not too great, and when you take care to approach or remove them successively by repeating the shock several times.

"The bottle here employed cannot hurt the vegetable economy, because its dimensions are not too great, and no batteries are brought in play. The electric shock, given in certain bounds, is useful to animals; it therefore cannot be noxious to plants in the same circumstances.

"This operation is not tedious even when employed upon a great number of trees; but if one wants still further to abridge it, I here give him a method by which the experiment can be made in the same instant upon all the trees of an orchard, and will not be more tedious than if it were employed upon one tree only. You have only to provide a sufficient number of iron-wires, and to dispose them as was done for the first tree we spoke of just now, and in the same manner; by which means all these trees form an elec-

250
How to
perform
the opera-
tion on a
great num-
ber of trees
at once.

Effects of
Electricity
on Vegeta-
tion.

trical chain, and the fluid in the explosion of the bottle will run over through the whole, supposing that you have discharged the bottle in the ordinary way, and at the same time taken care of what is very essential, that while the free extremity of the first wire touches the exterior surface of the electrical jar, the end of the other may communicate with the inside of the same charged phial.

251
How to de-
stroy a ca-
terpillar in
the root of
a tree.

"If the caterpillar be in the root, the operation is pretty much the same. By taking away, for an instant, a little earth, you easily put the affected roots within the chain: but if one is ignorant of the particular ramification of the root which is attacked, without uncovering the tree, you need only insert in the earth two wires opposite in their directions, and then perform the Leyden experiment, which is easily done. After having placed these two wires north and south, you may repeat the experiment by placing them east and west. You can hardly then miss the insect, especially if, in order to take in more space, you insert one of the wires farther than the other: for in this case the electric fluid will describe a diagonal, as we have already shown in regard to branches.

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To prevent
these ani-
mals from
generating
in plants.

"This method serves not only to prevent the progress of the evil, but in some sense to anticipate it. In regard to these destructive insects there are epochs as for plants; both of them have marked times for their birth, their developement, their growth, their multiplication, and that relative both to their genera and species. When the time is come that insects, caterpillars, and other animals attack plants, one must employ, by way of precaution, the method we have just now laid down; and by repeating the same from day to day for a certain space of time, we will at last succeed in preserving trees from the ravages of insects. The operation is neither tedious nor expensive; why then not have recourse to it for those curious and rare trees which come from afar at a great expence, and those valuable other trees that yield us yearly the most delicious fruits?

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Advantages
to be ex-
pected from
this me-
thod.

"The method just mentioned is the most effectual that can be imagined, since it pursues the enemy to his most concealed corners in the inmost texture of the wood, and is capable of killing him in the very heart of trees, under the bark when he is to be found there, in the branches, and in the heart of the roots themselves: all which we have made appear in the foregoing remarks. I may further add, that there is no other remedy known but by electricity; for how is it possible to find out under the bark of a tree one or more insects that gnaw and destroy it? Must we not in this case strip the mentirely of their bark? and would not, therefore, the remedy be often worse than the disease? Besides, by what means could we penetrate into the heart of the tree? Would not the instrument employed to cut and lop it, rather add to the mischief, especially in the beginning of its progress? How again could we rummage to the inside of the roots? The tree thus uncovered, would it not suffer, especially in the great heats, when a perspiration more abundant must render necessary a nourishment, whose quantity ought at all times to be equal at least to the waste? Thus the celebrated Linnaeus, struck with the calamities which

fruit-trees in particular suffer from insects and their caterpillars, cried out: "Who shall deliver us from this scourge?" *Quis possit liberare arbores fructiferas a larvis?"*

Effects of
Electricity
on Vegeta-
tion.

On this subject we cannot help observing, that there is some reason to suppose that the Abbe has over-rated the power of his remedy with regard to the destruction of insects. There is not the least doubt that an insect will be destroyed by finding a shock of electricity through its body; but while this insect is defended by the vegetable which it has pierced, and in which it lodges, the vegetable will also receive a very considerable part; and thus the insect may still escape, unless the shock be augmented to such a degree as to injure the vegetable also. His other experiments, it is said, have been confirmed by the observations of modern electricians.

SECT. XII. Effects of Electricity on Animals; of the Gymnotus, Torpedo, and other Electric Fishes; Medical Electricity.

Soon after the discovery of the electrical shock, and the method of augmenting the power of electricity, it naturally became an object with philosophers to investigate the effects of it upon animal bodies. These were quickly found to be entirely similar to such as are produced upon any other conducting substances, viz. an emission of sparks, attraction, and repulsion, &c. By degrees it was found, that very strong signs of electricity were exhibited by some animals, even without the application of any artificial apparatus.

The experiment of producing sparks by stroking the back of a cat in frosty weather, readily showed that the electric fluid may exist in a very active state in the body of an animal without injuring any of its functions. From animals of the inferior kind a transition was made to the human species; and signs of electricity were discovered in them where it had not been suspected before. Some people have been remarkable for an extreme lustre of their eyes; and others have been so much electrified naturally, as to give evident signs of it when a sensible electrometer had been applied to them. Others have manifested an extreme sensibility of even the smallest degrees of electricity, in so much that they would be affected by a flash of lightning, though so remote that the thunder could not be heard. All this showed that the subtle fluid we treat of bears a very active part in the animal economy, and led to more important researches on the subject. One of the first discoveries was, that some creatures are so strongly electrified naturally as to have it in their power to give a strong shock at pleasure, capable of destroying any small animal that comes near them. Of these, however, only three, and those of the aquatic kind, have yet been observed, viz. the gymnotus electricus, the torpedo, and another called the *filurus electricus*.

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Some ani-
mals natu-
rally elec-
trified.

The gymnotus* hath the astonishing property of giving the electric shock to any person, or number of persons, either by the immediate touch with the hand, or by the mediation of any metallic conductor; and a person who kept some of them told Dr Garden, that they had this property much stronger when first caught than afterwards.

* See the
article
Gymnotus.

Effects on
Animals.255
Electrical
properties
of the gym-
notus.

wards. "The person (says he) who is to receive the shock, must take the fish with both hands, at some considerable distance asunder, so as to form the communication, otherwise he will not receive it, at least I never saw any one shocked from taking hold of it with one hand only; though some have assured me, that they were shocked by laying one hand on it. I myself have taken hold of the largest with one hand often without ever receiving a shock; but I never touched it with both hands, at a little distance asunder, without feeling a smart shock. I have often remarked, that when it is taken hold of with one hand, and the other is put into the water over its body without touching it, the person received a smart shock; and I have observed the same effect follow when a number joined hands, the person at one extremity of the circle taking hold of or touching the fish, and the person at the other extremity putting his hand into the water over the body of the fish. The shock was communicated through the whole circle as smartly as if both the extreme persons had touched the fish. In this it seems to differ widely from the torpedo, or else we are much misinformed of the manner in which the benumbing effect of that fish is communicated. The shock which the gymnotus gives seems to be wholly electrical; and all the phenomena or properties of it exactly resemble those of the electric *aura* of our atmosphere when collected, as far as they are discoverable from the several trials made on this fish. This stroke is communicated by the same conductors, and intercepted by the interposition of the same original electrics, or electrics *per se* as they used to be called. The keeper of this fish informs me, that he caught them in Surinam river, a great way up, beyond where the salt-water reaches; and that they are a fresh-water fish only. He says, that they are eaten, and by some people esteemed a great delicacy. They live on fish, worms, or any animal-food if it is cut small so that they can swallow it. When small fishes are thrown into the water, they first give them a shock, which kills or so stupifies them, that they can swallow them easily and without any trouble. If one of these small fishes, after it is shocked, and to all appearance dead, be taken out of the vessel where the electrical fish is, and put into fresh water, it will soon revive again. If a larger fish than they can swallow be thrown into the water, at a time that they are hungry, they give him some smart shocks till he is apparently dead, and then they try to swallow or suck him in; but, after several attempts, finding he is too large, they quit him. Upon the most careful inspection of such fish, I could never see any mark of teeth, or the least wound or scratch on them. When the electrical fish are hungry, they are pretty keen after their food; but they are soon satisfied, not being able to contain much at one time. An electrical fish of three feet and upwards in length cannot swallow a small fish above three or at most three inches and a half long. I am told, that some of these have been seen in Surinam river upwards of 22 feet long, whose stroke or shock proved instant death to any person that unluckily received it."

256
Some very
large ones
found in
Surinam
river.

Several other accounts of this fish have been published by different persons, but none of them so full and distinct as the above. They all agree that the

electric virtue of the fish is very strong. Mr Fermin, in his natural history of Surinam, published in 1765, tells us, that one cannot touch it with the hands, or even with a stick, without feeling a horrible numbness in the arms up to the shoulders; and he farther relates, that, making 14 persons grasp each other by the hands, while he grasped the hand of the last with one of his, and with the other touched the eel with a stick, the whole number felt so violent a shock, that he could not prevail on them to repeat the experiment. V. Vanderlott, in two letters from Rio Essequibo, dated in 1761, makes two species, the black and the reddish; though he acknowledges, that, excepting the difference of colour and degree of strength, they are not materially different. In most experiments with these animals, he remarked a surprising resemblance between them and an electrical apparatus: nay, he observed, that the shock could be given to the finger of a person held at some distance from the bubble of air formed by the fish when he comes to the surface of the water to breathe; and he concluded, that at such times the electrical matter was discharged from his lungs. He mentions another characterizing circumstance, which is, that though metals in general were conductors of its electric property, yet some were found to be sensibly better than others for that purpose. Of this property Dr Priestley takes notice, and says, that a gold ring is preferable to any thing else. The same is likewise observed by Linnæus. Dr Priestley adds, that the sensation is strongest when the fish is in motion, and is transmitted to a great distance; so that if persons in a ship happen to dip their fingers or feet in the sea, when the fish is swimming at the distance of 15 feet from them, they are affected by it. He also tells us, that the gymnotus itself, notwithstanding all its electric powers, is killed by the lobster.

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Animals.257
Remark-
able difference of the
conducting
power of
metals with
regard to
this shock.

The surprising property of the torpedo* in giving a violent shock to the person who takes it in his hands, or who treads upon it, was long an object of wonder. For some time it was in general reckoned to be entirely fabulous; but at last the matter of fact being ascertained beyond a doubt, philosophers endeavoured to find out the cause. M. Reaumur resolved it into the action of a vast number of minute muscles, which by their accumulated force gave a sudden and violent stroke to the person who touched it. But solutions of this kind were quite unsatisfactory, because the stroke was found to be communicated through water, iron, wood, &c. When the phenomena of electricity began to be better known, it was then suspected that the shock of the torpedo was occasioned by a certain action of the electric fluid; but as not the least spark of fire, or noise, could ever be perceived, this too seemed insufficient. Of late, however, Mr Walsh has with indefatigable pains, not only explained this surprising phenomenon on the known principles of electricity, but given a demonstration of his being in the right, by constructing an artificial torpedo, by which a shock resembling that of the natural one can be given.

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Of the tor-
pedo. * For its
natural his-
tory, see
the article
Raja, of
which the
torpedo is
a species.259
Artificial
one made
by Mr
Walsh.

The electric organs of the torpedo consist of two sets of very small cylinders lying under the skin, one of which is electrified positively and the other negatively,

Effects on
Animals.

tively, seemingly at the pleasure of the fish. When a communication is made between the set of cylinders positively electrified and those which are negatively so, a discharge and shock ensue, like what happens in the case of the Leyden phial. The only difficulty now is to account for the total absence of a spark (which in the case of the torpedo never exists even in the smallest degree), and the impossibility of conducting the shock through the smallest interval of air. But this also is explained in a satisfactory manner by Mr Walsh, and shown to be nothing else than what every day takes place in our electrical experiments. It is well known, that a small charge of electricity, if put into a little phial, will occasion a bright spark and loud noise when discharged: but if the same charge is put into a phial much larger, the spark and noise will be less in proportion; neither will the spark break through near such a space of air in the latter case as in the former; though the shock would in both cases be the same to a person who received it through his body. If, instead of a large phial, we suppose the charge to be diffused all over a large battery, the shock would still be the same, and yet the spark and noise attending it would be almost imperceptible. The case is just the same with the torpedo. Each of the electric organs is a battery composed of innumerable small cylinders, which discharging themselves all at once produce a formidable shock; but by reason of the smallness of the charge of each, the spark is imperceptible, and cannot break through the least space of air. The truth of this was exemplified in Mr Walsh's artificial torpedo, which though it would give a very considerable shock through a conductor totally uninterrupted, yet on the least breach therein, even for the breadth of a hair, no shock was felt.

260
Why no
spark is dis-
covered in
the shock
given by
the torpe-
do.

In every other respect the electricity of the torpedo agrees with that exhibited by the common electrical machines. An insulated person cannot receive a shock by touching one of the electric organs of the fish; but a violent stroke is given to the person, whether insulated or not, who lays one hand on the positive and the other on the negative organ. The fish, as is reasonable to imagine, seems to have this electric property in its own power; and appears sensible of his giving the shock, which is accompanied by a kind of winking of his eyes.

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Of the filu-
rus electri-
cus.

The third fish which is known to have the power of giving the shock, is found in the rivers of Africa, but we have a very imperfect account of its properties (o). This animal belongs to the order called in Willoughby's system *filurus*; hence it is commonly called *filurus electricus*. Some of these fishes have been seen even above 20 inches long. The body of the *filurus electricus* is oblong, smooth, and without scales; being rather large, and flattened towards its anterior part. The eyes are of a middle size, and are covered by the skin which envelopes the whole head. Each jaw is armed with a great number of small teeth. About the mouth it has six filamentous appendices, viz. four from the under lip and two from the upper; the two external ones, or farthest from the mouth on the under lip, are the longest. The co-

lour of the body is greyish, and towards the tail it has some blackish spots. The electric organ seems to be towards the tail, where the skin is thicker than on the rest of the body; and a whitish fibrous substance, which is probably the electric organ, has been distinguished under it. It is said that the *filurus electricus* has the property of giving a shock or benumbing sensation like the torpedo, and that this shock is communicated through substances that are conductors of electricity; but no other particular about it is known with any considerable degree of certainty.

An inquisitive mind will immediately ask, for what purpose has nature furnished those animals with so singular a property? But the present knowledge of the subject seems to furnish no other answer, except that they are endowed with the power of giving the shock for the sake of securing their prey, by which they must subsist, and perhaps of repelling larger animals which might otherwise annoy them.

The ancients considered the shocks given by the torpedo as capable of curing various disorders; and a modern philosopher will hardly hesitate to believe their assertions, after that electricity has been found to be a remedy for many diseases.

Besides these animals which manifest their electric power evidently by giving a strong shock, there are others in which the fluid seems to act by the emission of light. This indeed has not been proved by actual experiment, tho' it would certainly be well worth while to try whether by insulating a number of them, any more evident signs of electricity could be obtained. These creatures are of the insect tribe; some of them furnished with wings, as the shining flies in the warm countries; while others, as the glow-worm, crawl perpetually on the earth. It is most probable also, that the sparkling of sea-water is owing to the electricity of the insects which occasion it. Be this as it will, however, from the instances already adduced, it is certain that the electric fluid pervades at all times the whole body of every animal; whence, by exciting or diminishing its action, it is reasonable to suppose that many important changes might be made in the human body, and hence the foundation of *Medical Electricity*.

Though the effects of this fluid as a remedy for diseases fall particularly to be mentioned under the article MEDICINE, we cannot help here taking notice, that a very strange uncertainty remains concerning what we should imagine to be its first and most obvious effects; namely, whether simple electrification has any effect in quickening and augmenting the pulse? This was said to be the case by the first electricians, but denied by their successors; and even when the great machine at Haarlem is made use of, it still remains doubtful whether there be any effect of this kind or not.

The shock of the Leyden phial having been found effectual in removing some complaints, the use of it was introduced into the common practice of medicine; and is still continued, though a more gentle method of using the fluid is now generally preferred. The apparatus for the medical electrician, besides the machine for already described, consists of the following parts. 1. An

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Apparatus
for apply-
ing it for
the pur-
poses of me-
dicine.

(o) Messrs Adanson and Forskal make a short mention of it, and M. Broussonet describes it under the French name of *le Trembleur* in the Hist. de l'Academie Royale des Sciences for the year 1782.

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Electricity.

insulating stool with glass feet, or, what is much better, an arm chair, well rounded at the edges of the wooden parts, and fixed on a large stool with glass feet, which should be at least nine or ten inches in length; for the longer the feet are, the better will the insulation be. The inside part of the back of the chair should move on an hinge, that it may occasionally be let down to the stool, and so the back of the patient be electrified more conveniently; the arms of the chair should be made longer than ordinary. 2. A Leyden bottle with a discharging electrometer. 3. A pair of directors of considerable size, with glass handles and wooden points. 4. A large metallic ball of brass or copper, with a metallic handle to receive the sparks. The ball should be unscrewed, and the wire long and sharp pointed to receive the stream of electric fire. 5. A few glass tubes of different bores, some of them with capillary points. 6. Several yards of brass wire or chain; or, which is much better, several lengths of wires with loops at the end; the part of the wire between these being covered with some non-conducting substance, as a silk ribbon, &c.

Plate
CLXXV.

The directors are represented by fig. 29. the handles being of glass, one of them having a ball on its end represented by *A*; the other is without the ball, having its wire bent for the convenience of conducting the electric stream on the eye, &c. Either of the balls may be unscrewed from the wires, and the wooden point *B* screwed in its place, or the pointed end of the brass wire used. The glass handles should be held as far from the brass work as possible. To convey the electric fluid to the ear or throat, glass tubes with sliding brass wires through them should be made use of, such as are represented in fig. 30.

Fig. 31, 32. represent the electric forceps, which is thought by some electricians to be more convenient for giving the shock than the directors. Fig. 33. is the medical jar, with an electrometer, that regulates the strength of the shock, and enables the operator to give a succession of them of nearly equal force. On the upper part of a bent piece of glass *C* is cemented a brass socket *D*, which is fastened to a spring-tube *E*; a wire *F* moves in this tube, so that the ball *G* may be set at any required distance from the ball *H*. The end *I* of the bent piece of glass is also cemented to a spring tube, which slides upon the wire *K*, communicating with the inside of the jar.

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How to
give a shock
to a parti-
cular part
of the body.

To use this medical jar, the ball *H* must be placed in contact with the conductor of the electrical machine, or at least be connected with it by a wire; after which it is to be charged in the usual manner. If a wire proceeds from the ball *L* to the outside coating, the jar will be immediately discharged, as the accumulation of the electric fluid is sufficiently powerful to pass through the space of air between the two balls: hence a shock may be communicated to the arm by means of the wires and directors as in the figure, and it will be stronger in proportion as the distance of the ball *G* from *H* is augmented. This electrometer acts in the manner of the common discharging rod, and therefore has received the name of the *discharging electrometer*.

Plate
CLXXIII.

In fig. 6. we have a representation of Mr Lane's electrometer applied to the machine for medical elec-

tricity. *G*, the lower part of which is inclosed in the pillar *F*, is made of wood baked and boiled in linseed-oil, and bored cylindrically for two-thirds of its length. The brass work is fixed to the pillar by the screw *H*, and is moveable in the groove *I*, so that it may be raised higher or lower as the height of the jar *D* requires. A steel screw *L* passes through the brass work, having its threads about $\frac{1}{4}$ th of an inch distant from one another. To the end of this, and opposite to *K*, is fixed a hemispherical and well polished piece of brass; and a brass ball *M*, likewise well polished, is fixed to the prime conductor. To this screw is annexed a circular plate *O*, divided into 12 equal parts; and in every revolution of this screw pointing to the divisions of the scale *N*, each of which are equal to one turn of the screw. The use of this electrometer is to discharge the jar *D*, or any battery connected with the prime conductor, when the machine is not applied to medical purposes. If a person holds a wire fastened to the screw *H* in one hand, and another wire (fixed to *E* by a loop of brass) passing from the frame of the machine to a tin-plate on which the jar *D* stands, or the hook *E* connected with it, he will perceive no shock when *K* and *M* are in contact; and the degree of explosion, as well as the quantity of electricity accumulated in the jar, will be regulated by the distance of *K* and *M* from each other.

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Electricity.

The improved way of applying the discharging electrometer to the conductor, is found to be much more convenient and ready than any other; as it has also the advantage of being useful to a jar or battery of any size. See fig. 6. where *a A* represents the electrometer as applied to the conductor; *cd* the improved medical jar suspended at a small distance from it. A small glass tube *ef* is fixed in this jar, a part of the lower end of which is coated. Two wires pass through the brass ball *C* on the top of this tube; one of which is connected with the bottom of the jar, and the other goes only to the internal coating of the small tube. The wires are moveable at pleasure, and the jar is suspended from the conductor by a brass ring; and a chain or wire must be fixed to the hook *d* at the bottom. From a bare inspection of the figure, it appears that the arm will receive the shock by the discharge of the jar *acd*: for, by turning the cylinder round, the jar soon becomes charged either with one or both wires in it; and directly as the charge becomes sufficiently strong to pass through the air, it will explode, and the fluid pass to the end of *b* next to it, going through the wire to the wrist, and from thence up to the other chain at the shoulder. By reversing the positions or the connections of the two wires, the progress of the shocks will be reversed, viz. from the shoulder to the wrist. If the short wire alone be left in the jar *cd*, and the discharging ball of the electrometer *abc* be placed from a quarter of an inch to a whole one from the conductor, a most delicate small shock may be given, and repeated any number of times at pleasure. This is called the *electrical vibrating shock*.

Fig. 31. *g* represents the bottle director. It is hollow, and coated like a common jar, acting as such, and in some cases is looked upon as convenient. With this, as with the common director, it is proper to press the ends against the part where the shock is to be applied.

Fig.

Medical
Electricity.

Plate
CLXXVI.

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Pocket electrical apparatus.

Fig. 56. represents a small pocket electrical apparatus, which may sometimes be of use for medical purposes as well as others. It is packed up in a very small size, being only five inches long, two broad, and one deep. It is capable of a tolerable strong charge or accumulation of electricity, and will give a small shock to one, two, three, or a greater number of persons.

A is the Leyden phial or jar that holds the charge; *B* is the discharger to discharge the jar when required without electrifying the person that holds it; *C* is a silk ribbon prepared by a coating of varnish, so as to be excited, and communicate its electricity to the jar; *D* are two hair, &c. skin rubbers, which are to be placed on the first and middle fingers of the left hand, and serve to excite the ribbon *C*.

To charge the jar. Place the two finger-caps *D* on the first and middle finger of the left hand; hold the jar *A* at the same time at the joining of the red and black *E* on the outside between the thumb and first finger of the same hand; then take the ribbon in your right hand, and steadily and gently draw it upwards between the two rubbers *D*, on the two fingers, taking care at the same time the brass ball of the jar is kept nearly close to the ribbon while it is passing through the fingers. By repeating this operation 12 or 14 times the electrical fire will pass into the jar, which will become charged; and by placing the discharger *C* against it, as in the plate, you will see a sensible spark pass from the ball of the jar to that of the discharger. If the apparatus is dry and in good order, you will hear the crackling of the fire when the ribbon is passing through the fingers, and the jar will discharge at some distance.

To electrify a person. You must desire him to take the jar in one hand, and with the other touch the knob of it: or, if diversion is intended, desire the person to smell at the knob *A* of it, in expectation of smelling the scent of a rose or a pink: this last mode has occasioned it to be sometimes called the *magic smelling bottle*.

The following are the principal methods by which electricity may be applied to the human body with a medical view.

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Various
methods of
applying electricity.

1. *By merely placing the patient in an insulated chair, and connecting him with the prime conductor.*—When the machine is in action, he will thus be filled with the electric fluid, which will be continually dissipated from the points and edges of his clothes: and though the effects of this are probably too slow to be rendered very advantageous, yet a sedentary person might perhaps derive some benefit from sitting in an insulated chair, having before him an insulated table, the chair to be connected with the ball of a large charged jar or battery; by which means a small quantity of the fluid will be continually passing through those innumerable capillary vessels, on the right state of which our health so much depends.

2. *By throwing the fluid upon, or extracting it from a patient, by means of a wooden point.*—This may be effected in a twofold manner: 1st, By insulating the patient, and connecting him either with the cushion or the positive prime conductor, the operator presenting the point. 2^d, Let the patient stand upon the ground, and the wire of the director be connected either with the positive or negative parts of the machine. The

sensation produced by the fluid when acting in this manner is mild and pleasing, resembling the soft breezes of a gentle wind; generating a genial warmth, and promoting the secretion and dissipation of tumors, inflammations, &c.

3. *By the electric friction.*—Cover the part to be rubbed with woollen cloth or flannel. The patient may be seated in an insulated chair, and rubbed with the ball of a director that is in contact with the conductor; or he may be connected with the conductor, and rubbed with a brass ball which communicates with the ground. The friction thus produced is evidently more penetrating, more active, and more powerful, than that which is communicated by the flesh brush; and there is very little fear of being thought too sanguine. This, when used but for a few minutes, will be found more efficacious than the other after several hours application.—Electricity applies here with peculiar propriety to spasm, pleurisy, and some stages of the palsy; and in every case answers the end of blistering where the discharge is not wanted, being the most safe and powerful stimulant we know.

4. *By taking strong sparks from the patient.* Here, as in every other case, the operator may connect the ball of the director with the positive or negative conductor, or he may connect the patient with either of these and the ball with the ground. Now it is clear from what has been already laid down, that if the director be connected with the positive conductor, the fluid is thrown upon the patient, if with the cushion the fluid is extracted from him. Let the patient be insulated, and the action is in some measure reversed; if he is joined to the negative conductor or cushion, he will receive a spark from a person standing on the floor; but if he communicates with the positive conductor, he will give the spark to the person on the ground.

5. *By causing a current of the electric fluid to pass from one part of the body, and thus confining and concentrating its operation without communicating the shock.* Place the patient in an insulated chair, and touch one part of the body with a director, joined to a positive conductor; then with a brass-ball communicating with the ground touch another part; and when the machine is in action the fluid will pass through the required part from the conductor to the ball; the force of the stream will be different according to the strength of the machine, &c. Or connect one director with the cushion and the other with the positive conductor, and apply these to the part through which the fluid is to pass, and when the machine is in action the electricity will pass from one ball to the other. It is not necessary to insulate the patient in this case.

6. *By the shock.* Which may be given to any part of the human body, by introducing that part of the body into the circuit which is made between the outside and inside of the bottle. This is conveniently effected, by connecting one director by a piece of wire with the electrometer and the other with the outside of the bottle; then hold the directors by their glass-handles, and apply the balls of them to the extremity of the parts through which the shocks are to be passed. The force of the shock, as we have already observed, is augmented or diminished by increasing or lessening the distance between

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between the two balls, which must be regulated by the operator to the strength and sensibility of the patient. Instead of the common bottle, we may have a small one with a glass tube proceeding from it, through which proceeds a wire and hook to hang it upon the machine, with a longer one from the outside coating, and which is to be carried by means of a director to the patient. When this is used as a common bottle, both wires are to be left there, and the shock is communicated by two directors, one connected with the bottom, the other with the top. The operator will often find himself embarrassed in giving small shocks, the fluid passing from the conductor to the ball of the electrometer, instead of going through the circuits he desires: when this happens, which may be known by the chattering noise of the spark, the resistance formed to the discharge is so great, that the fluid cannot force its way through the circuit: to remedy this, pass two metallic pins through the cloathing, so that they may be in contact with the skin, which will lessen the resistance and conduct the fluid.

7. *By a sensation between a shock and the spark, which does not communicate that disagreeable feeling attending the common shock.* This is effected by taking out the long wire from the small medical bottle, and leaving the shorter one which is connected with the tube in its place, the directors to be connected and used as before. The effect of this species of shock, if it may be called one, is to produce a great vibration in the muscular fibres, without inducing that pungent sensation which the shock effects. It is therefore applicable to some stages of palsy and rheumatism; it may also serve as an artificial means of exercise.

Fig. 31.

8. *By the bottle-director.* Insulate the patient, and place one of the balls in contact with him; by which means this director is charged. Now if a wire is conveyed from the bottom of this to the top of another director, the bottle-director will be discharged whenever the other ball *b* is brought in contact with the patient; so that by bringing it down with rapidity, any number of small shocks may be procured in a minute: or connect the insulated patient with the top or inside of a large charged jar, and then this apparatus used in the foregoing manner will discharge from the large jar at each spark its own contents, and by repetition discharge the whole jar: thus a number of shocks may be given without continually turning the machine or employing an assistant.

9. *By passing the whole fluid contained in the Leyden phial through a diseased part without giving the shock.* Connect a director, by means of a wire, with the ball of a Leyden jar; charge the jar either completely or partially, and then apply the ball or point of the conductor to the part intended to be electrified, and the fluid which was condensed in the phial will be thrown on the part in a dense slow stream, attended with a pungent sensation which produces a considerable degree of warmth. If a wire that communicates with the ground is placed opposite to the end of the director, the passage of the fluid will be rendered more rapid, and the sensation stronger. Or insulate the patient, connect him with the top of a jar, charge this, and then apply a metal wire or piece of wood to the part thro' which you mean to make the fluid pass. It is obvi-

ous, that in this case the circuit between the inside and the outside of the jar is not completed, therefore the shock will not be felt. The condensed fluid passes in a dense slow stream through the required part, while the outside acquires a sufficient quantity from substances near it to restore the equilibrium.

It is in all cases most advisable to begin with the more gentle operations, and proceed gradually to increase the force as the strength and constitution of the patient or the nature of the disorder requires. The stream from a wooden point, a wooden ball, or brass point, may be first used; sparks, if necessary, may then be taken, or small shocks given.

In rheumatic cases the electric friction is generally used. If the pains are local, small shocks may be given. To relieve the toothache, very small shocks may be passed through the tooth; or, cover the part affected with flannel, and rub it with a director communicating with the machine.

In inflammations and other disorders of the eyes, the fluid should be thrown from a wooden point: the sensation here produced is that of a gentle cooling wind; but, at the same time, it generates a genial warmth in the part affected.

In palsies, the electric friction and small shocks are administered. Streams of the fluid should always be made to pass through the affected part.

The only treatise we have yet had from the faculty on the subject of medical electricity is a pamphlet, intitled, *Considerations on the Efficacy of Electricity in removing Female Obstructions*, by Mr Birch; and if its merits were to be confined to this disease alone (in which it may be reckoned a specific), it would be intitled to the attention of practitioners; but we have reason to expect much more from it, since the prejudices of the faculty seem removed, and the practice is becoming more general every day.

SECT. XIII. Of the Uses of the Electric Fluid in the System of Nature at large.

THESE are so many and so various, that it may be said without much exaggeration, that whether we look to the heaven above or to the earth beneath, we can scarce perceive any thing that is not acted upon, and in a manner perfectly subjected to the operations of this wonderful fluid. If we attend to the common phenomena of our atmosphere, experiments show that electricity is connected with every one of them. If we evaporate water by means of heat, it appears from the experiments of M. Saussure, related n^o 201. *et seq.* that a strong electricity is produced. If vapour is condensed into rain, a quantity of electricity is also produced; and if water is frozen into ice, if it descends in hail or snow, electricity appears to be equally concerned. When clouds emit their electricity in great quantities, they instantly dissolve in rain; which is more or less heavy according to the quantity of electricity discharged, as in thunder-storms; and when this quantity is excessive, a vast many discharges are frequently made before the rain can descend. Hence it is reasonable to conclude, that though heat may be the cause of the first rise of vapour, it is the electric fluid which unites it with the air in such a manner as to be

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Electricity
concerned
in the pro-
duction of
clouds, rain,
hail, snow,
&c.

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be perfectly dissolved and become transparent in it (P). This is confirmed by an observation related under the article CLOUD; namely, that small clouds floating in the atmosphere will frequently be seen to attract one another, and so meet together; after which, if they have been of nearly an equal size, both will almost instantly vanish. Transparency itself, as we have seen in many instances through the course of this treatise, depends on the vibratory motion of the electric fluid; and when we are assured that it depends on this in several cases, we may conclude from analogy that it does so in all. In the case of vapour dissolved in the atmosphere, therefore, as long as this particular motion continues through it, the vapour remains dissolved and transparent; but when the electricity comes to be disposed to assume the other motion, of which it is exceedingly susceptible, viz. that of running in a stream from one place to another, the vibratory motion ceases, the vapour formerly dissolved loses its transparency, and appears in the form in which it was originally raised by heat, viz. that of an opaque smoke or mist. As this mist must always be electrified (for it is in the disposition of the fluid to fly to a distant place that electricity consists), the fluid then begins to exert its power of attraction, and the mist collects in bodies larger or smaller according to the quantity of motion with which the electric matter is affected: and thus we see how by means of this disposition of the fluid, cloudy weather, rain, or the most violent thunderstorms, may be produced.

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It regulates
the heat of
the differ-
ent cli-
mates.

On looking farther into the operations of nature, we find the electric fluid acting in a still higher capacity, and regulating the temperature of the different climates throughout the world. Under the article CHEMISTRY, n^o 99. it has been shown, that what is heat in summer becomes electric fluid in winter; and under the article COLD, it has been shown that cold as well as heat is a positive substance. In the present treatise it has been proved at length, that the electric fluid and the light of the sun are the same; the former being in truth no other than the solar light absorbed by the earth, entangled among its particles, becoming subject to new laws, and acting in many cases as if it were a distinct fluid. Hence it becomes a proper antagonist to the light itself: for as the latter is only the fluid of electricity moving in a vibratory manner, and what we call electricity is the same fluid either in a comparatively stagnant situation, or disposed to run with violence from one place to another; it is plain that the motion of the light must be opposed by the fluid tho' stagnant, and much more if it be moving in any opposite manner. But the action of light when augmented is heat: the power which opposes it therefore, i. e. the electric fluid moving in an opposite direction, as explained under CHEMISTRY, n^o 102. is cold itself; and hence the strong electric appearances in the atmosphere in cold countries, or in cold weather even in our own country. Hence also the electricity of the

N^o 114.

serene sky is weaker in summer than in winter; and combustion, which is a very strong vibratory action of the electric matter, produces no electricity, the one action being inconsistent with the other. The electric fluid therefore regulates the light and heat of the sun throughout the whole world, and is itself regulated by them; so that neither heat nor cold can ultimately predominate any where.

Descending from the atmosphere into the earth itself, we find the electric matter no less concerned there than in the atmosphere. It has been already observed, that its vibratory motion probably gives transparency to all bodies. Sometimes this motion is augmented to a great degree, as in the waters of the ocean, which become unusually clear before tempests and hurricanes. Its action in producing earthquakes is explained at large under the article EARTHQUAKE, as well as in setting fire to volcanoes under the article VOLCANO. Like other fluids, its action seems to gain a great increase of power when it runs for a considerable way along any conductor. This may be easily conceived from the consideration, that the substance along which it runs is every where pressed by a fluid of the same kind, which continually accelerates its motions, and at last gives them an intensity capable of acting as the most vehement fire. The fact has been long observed, and is confirmed by the experiments of Mr Wilson in the Pantheon as well as by those of later electricians. In the former, the spark taken from a vast conductor of 155 feet in length, was so strong that it resembled the discharge of a large jar, or rather a small battery; and was so very pungent, that few who had tried it once would venture on a second experiment. The latest experiments were made with a number of tin conductors joined to each others ends: in which situation it was found that the spark taken from them was much stronger than when they were laid at each others sides, though the surface was in both cases exactly the same. Hence we see, that if by any means the electric fluid shall meet with an unusually good conductor for a considerable way through the earth, the extremity of that conducting part may be heated, set on fire, or violent explosions issue from it; and the same thing will take place in the atmosphere. Upon this principle then may we account for natural hot-baths; explosions suddenly issuing from the earth, by which people have sometimes been killed; clouds and whirlwinds charged with an enormous quantity of electricity, and far beyond what in the ordinary way they could contain, &c.

Thus, to the action of the electric fluid we are in an especial manner to ascribe the temperature of the air throughout the whole globe; all the phenomena of rain, snow, hail, lightning, tempests, and in all probability the currents of the air itself named winds. Certain it is at least, that every electrified substance has an atmosphere round it resembling a gentle blast of

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Acts in
many va-
rious ways
in the sub-
stance of
the earth
itself.

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Almost all
terrestrial
phenomena
to be ascri-
bed to it.

(P) In this there appears some inaccuracy of expression: but as it is somewhat difficult to find terms at once sufficiently accurate and intelligible, we shall hear observe, that by the word *heat* we mean the electric or universal fluid moving in a certain manner, viz. from a centre to a circumference; by *cold*, the same fluid pressing from a circumference to a centre; by the *electric fluid* simply, the same either comparatively stagnant, or moving in any other way than those just mentioned.



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of cool air; and it is also very remarkable, that the electric fluid itself cannot be blown away from any substance, even by the most violent blast of air we can imagine. An undoubted evidence of this is, that if you set up a small ball or pointed body upon the conductor of a strong machine, so that a stream of electric light may issue from it, it will not be in your power to turn this flame aside in the smallest degree by the most violent blast of a bellows. On the contrary, if any body is presented to it which has a tendency to attract, the flame will move across the blast of air directly contrary to it, or in the same direction with it, in the very same manner as if no such thing was present. As the electric fluid therefore acts independent of the air, and cannot have its motions controlled by it, it is highly probable that all the motions of the atmosphere are controlled by this fluid alone: and indeed if we allow it to be the proper antagonist to the light of the sun itself, we must readily allow it also to be the regulator of every other power on this earth.

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Is probably
the cause of
vegetation

Its effects on vegetation have been treated of in the last section, though we cannot certainly say that it is the original cause of this process. It seems, however, to be the true cause of CRYSTALLIZATION; which, as remarked under that article, probably is only an incipient or imperfect vegetation. The most convincing proof of this is from the experiments of Mr Lichtenberg with a large electrophorus; in which the knob of an electrified phial being drawn over the surface of the electric plate, finely powdered rosin afterwards sifted upon the place assumed the figure of stars and other beautiful ramifications, indicating not only an inclination to arrange itself in the same regular order with the crystals of salts, but to run out into branches like those of vegetables. These experiments have been repeated to great advantage by the Reverend Mr Bennet, according to whose method the figures represented in Plate CLXXIX were made. The apparatus used for making them consisted only of a common Leyden phial, and a plate of glass 15 inches square covered on one side with a varnish of gum lac dissolved in spirit of wine (Q), and several times laid over. The other side is covered with tin-foil laid on with common paste. When it is to be used, the glass-plate is put upon a metallic stand with the tin-foiled side laid undermost; the phial is to be charged, and the knob drawn over the varnished side. Thus any kind of figure may be drawn or letters made as represented in the plate; and from every figure beautiful ramifications will proceed, longer or shorter according to the strength of the charge. On some occasions, however, the charge may be too strong, particularly where we wish to represent letters, so that the whole will be blended into one confused mass. The round figures are formed by placing metallic rings or plates upon the electrical plate; and then giving them a spark from the electrified bottle, or sending a shock through them. The figures may be rendered permanent by blowing off the loose chalk, and clapping on a piece of black-sized paper upon them; or if they are wanted of another colour, they may easily be obtained by means of lake, vermilion,

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rose-pink, or any of the ordinary colours ground very fine. The easiest way of applying them seems to be by a barber's puff-bellows.

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This tendency of the electrical fluid to produce ramifications in its passage through other substances, is likewise evident from the figure of the positive flashes described by Mr Nicholson, and represented Plate CLXXVIII. It may indeed be objected, that in both cases the fluid has to make its way thro' non-conducting substances, where it meets with a considerable resistance; so that the case cannot be applicable to vegetation, where a ready conductor is always found in the moisture with which the earth abounds. But if we consider that the earth, and every thing contained in it, is already saturated with electric matter, it must readily appear that no new quantity can be forced into it without meeting with a considerable resistance; and therefore it will branch out and divaricate in the very same manner when passing through the earth, that it does when artificially sent through the air, or made to diffuse itself on the surface of an electric substance. If in the earth it meets with such particles as serve to facilitate its passage, these will be arranged according to the direction of the fluid itself; and thus these particles being consolidated by other powers, or by electricity itself acting in a different manner, may be supposed to assume the figures of branched roots; while the continual accumulation of new matter augments them in bulk, and is what we call the *growth* of the plant, or its drawing nourishment from the ground. It is not indeed pretended that we can explain the manner in which plants grow; the utmost we can do is to attain some slight and general idea of the cause, and how by the action of that cause, directing itself according to the laws given it by the Author of nature, the effects may be produced. This is sufficient to satisfy the curiosity natural to the human mind: a farther knowledge would not only be entirely useless, but in all probability is inconsistent with the limited state of our faculties at present. What is here said concerning vegetation, may be applied equally to the formation and growth of animal bodies; but this subject is still more obscure and difficult: it has been supposed by many, however, that the nervous fluid is the same with that of electricity; for which many probable reasons might be assigned, though the subtilty and invisibility of both must for ever prevent us from obtaining any direct proof on this subject.

When we consider the rest of the terrestrial phenomena, we find the same fluid concerned in every one of them, or rather acting as their only cause. There is not in nature a more surprising phenomenon than that of the magnet; and this, by repeated experiments, has been proved to depend on electricity. Magnetical needles have often been endowed with their virtue by means of artificial electricity, and iron has been known to receive it from lightning; whence we may reasonably conclude, that the power of the magnet at all times depends upon the secret operation of the electric fluid. By extending its power to the production of attractive and repulsive forces in all cases, and which from many

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Is the cause
of magnetism,
and probably of
attraction
of every
kind.

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(Q) Two ounces of shell-lac powdered and mixed with six ounces of spirit of wine answers very well for this purpose. The glass must be warmed, and the varnish spread upon it with a camel's hair pencil. Care must be taken, however, not to lay it on too thick, otherwise the effect will not follow.

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natural phenomena is extremely probable, we shall still give it a higher rank in the system of nature. We shall now find it guiding the planets in their courses through the heavens, giving stability and cohesion not only to terrestrial substances, but to the globe of earth itself, and to all other bodies in the universe.

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Count Tressan's system
of natural
philosophy.

A system of natural philosophy on this principle was begun in the year 1747, and lately published by the Count de Tressan. In this the electric fluid is considered as the first principle of motion in the universe, and the immediate agent by which the system of nature is governed. According to him, the fixed stars themselves are no other than as many foci of action communicating electricity to their surrounding planets, which have electric atmospheres of different extents. He shows the operation of the fluid in all the different phenomena of earth, air, water, fire, &c. descending even to the most minute, as well as considering the most grand and sublime, exhibitions of nature. That the electric fluid is capable of imitating many of these phenomena, is certain; as for example, those of earthquakes, water-spouts, tides, &c. of which an account is given under their proper articles. By means of the same fluid also we may imitate the planetary motions; and for this several contrivances have been fallen upon: the principal are as follow.

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Methods of
imitating
the planeta-
ry motions.

1. From the prime conductor of an electric machine suspend six concentric hoops of metal at different distances from one another, in such a manner as to represent in some measure the proportional distances of the planets. Under these, and at the distance of about half an inch, place a metallic plate, and upon this plate, within each of the hoops, a glass-bubble blown very thin and light. On electrifying the hoops, the bubbles will be immediately attracted by them, and will continue to move round the hoops as long as the electrification continues. If the electricity is very strong, the bubbles will frequently be driven off, run hither and thither on the plate, making a variety of surprising motions round their axis; after which they will return to the hoop, and circulate as before; and if the room is darkened, they will all appear beautifully illuminated with electric light.

2. Provide a ball of cork about three quarters of an inch in diameter, hollowed out in the internal part by cutting it in two hemispheres, scooping out the inside, and then joining them together with paste. Having attached this to a silk thread between three and four feet in length, suspend it in such a manner that it may just touch the knob of an electric jar, the outside of which communicates with the ground. On the first contact it will be repelled to a considerable distance, and after making several vibrations will remain stationary; but if a candle is placed at some distance behind it, so that the ball may be between it and the bottle, the ball will instantly begin to move, and will turn round the knob of the jar, moving in a kind of ellipsis as long as there is any electricity in the bottle. This experiment is very striking, tho' the motions are far from being regular; but it is remarkable that they always affect the elliptical rather than the circular form.

3. Cut a piece of India paper in the shape of an isosceles triangle, whose sides are about two inches long, and two-tenths of an inch in breadth; then erect a brass ball of two or three inches dia-

meter on a brass wire one-sixth of an inch in thickness, and two feet six inches long, on the prime conductor: electrify the conductor, and then bring the obtuse end of the piece of paper within the atmosphere of the ball; let it go, and it will revolve round the ball, turning often round its own axis at the same time.

We shall not here enter into any speculations concerning the way in which it might be supposed possible to produce the planetary motions by means of the efflux of the sun's light, and the return of the electric fluid towards him. Before we can make excursions into these celestial spaces, it is absolutely necessary to remove an objection derived from Mr Morgan's experiment, that the electric fluid cannot pervade a perfect vacuum; and from which he concludes, that the electric fluid cannot pass beyond the limits of our atmosphere. On this experiment, however, we must observe, that though it were really proved in a much more decisive manner than is done by this experiment, that the fluid cannot be *artificially* driven through a vacuum, this would not prove that it cannot naturally pass through it, unless we should suppose the powers of nature and of art to be equal to one another. But that even the powers of art, in Mr Morgan's experiment, have not a fair chance of success, is evident from an inspection of fig. 80. Here he endeavours to force the electric fluid through a long course of perfect vacuum, and finds the power of his machine insufficient for the purpose. Yet one of Mr Morgan's own experiments might have led him to vary this one in such a manner as would perhaps have shown the possibility of transmitting the fluid through the most perfect vacuum that can be made. He informs us, that a spark, which in the open air cannot exceed one quarter of an inch diameter, will appear to fill the whole of an exhausted receiver four inches wide and eight inches long; tho' in the latter case it will be excessively faint in comparison with what it would have been in the atmosphere: yet, in order to prove that the faintness of the electric light *in vacuo* depends on the enlarged space through which it is diffused, we have only to introduce two pointed wires into the vacuum, so that the fluid may pass from the point of the one to the point of the other; and when the distance between them is not more than the tenth of an inch, in this case we shall find the spark as bright as in the open air.

The inference to be derived from this experiment is obvious. Had Mr Morgan, instead of attempting to cause the fluid pass through the whole length of the vacuum, put two wires in the inside at a small distance from each other, as described in the experiment just now mentioned, it is very probable that the fluid would have made its way through that small distance. It must be acknowledged indeed, that, considering the very great difficulty of making this experiment at any rate, we could scarce expect that this additional trouble could be taken: but without this, or something equivalent, his conclusion cannot by any means be allowed to be just; nor, even if it had been tried, would it have determined the question in his favour.

The great difficulty in this experiment is to give a reason why in a certain degree of exhaustion the vacuum should be so easily penetrated by the fluid, and in another should make such resistance; but the following considerations will probably throw some light on this.

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Objections
from an ex-
periment of
Mr Mor-
gan's an-
swered.

Fig. 83.



Fig. 82.

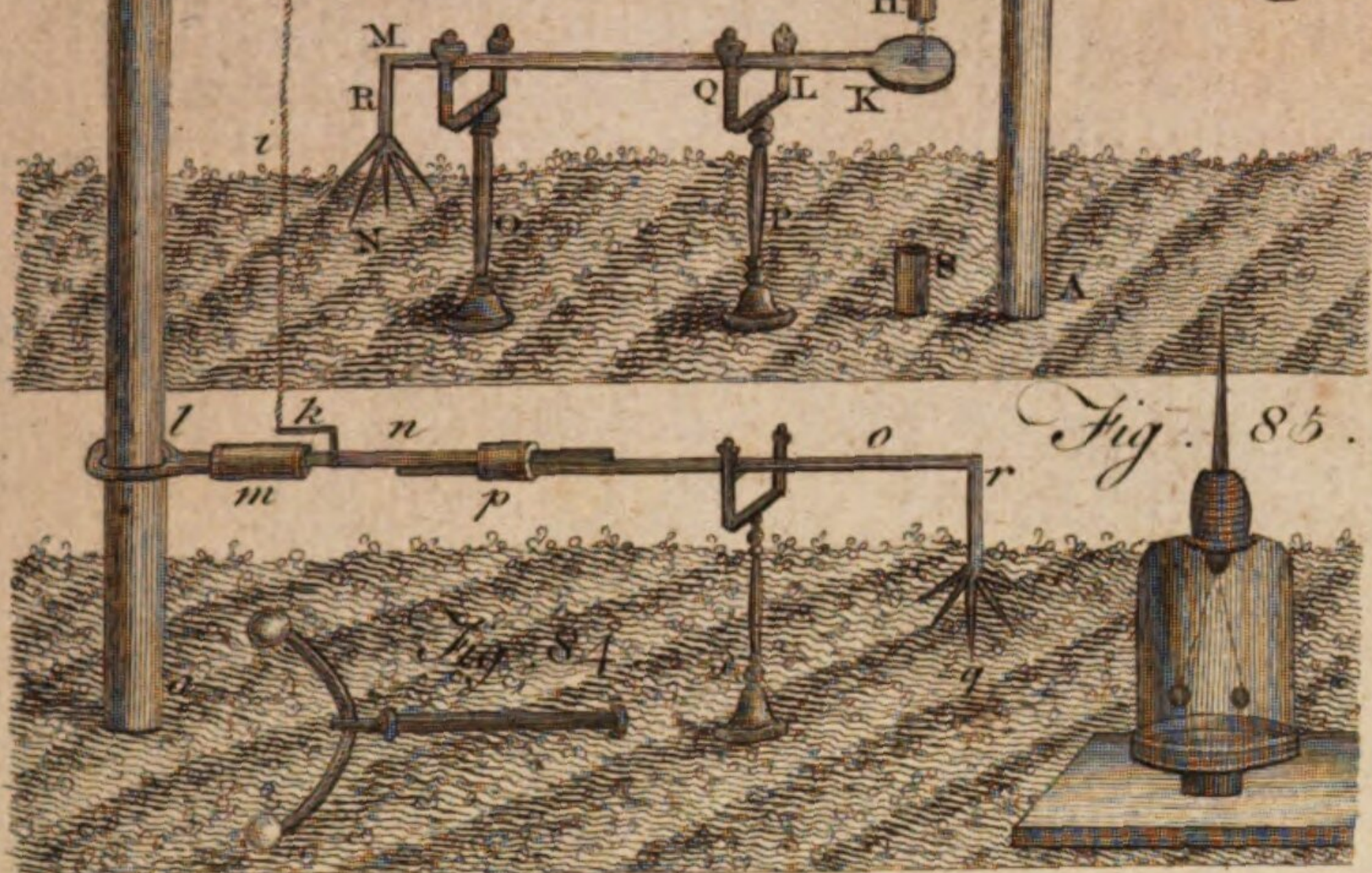


Fig. 80.



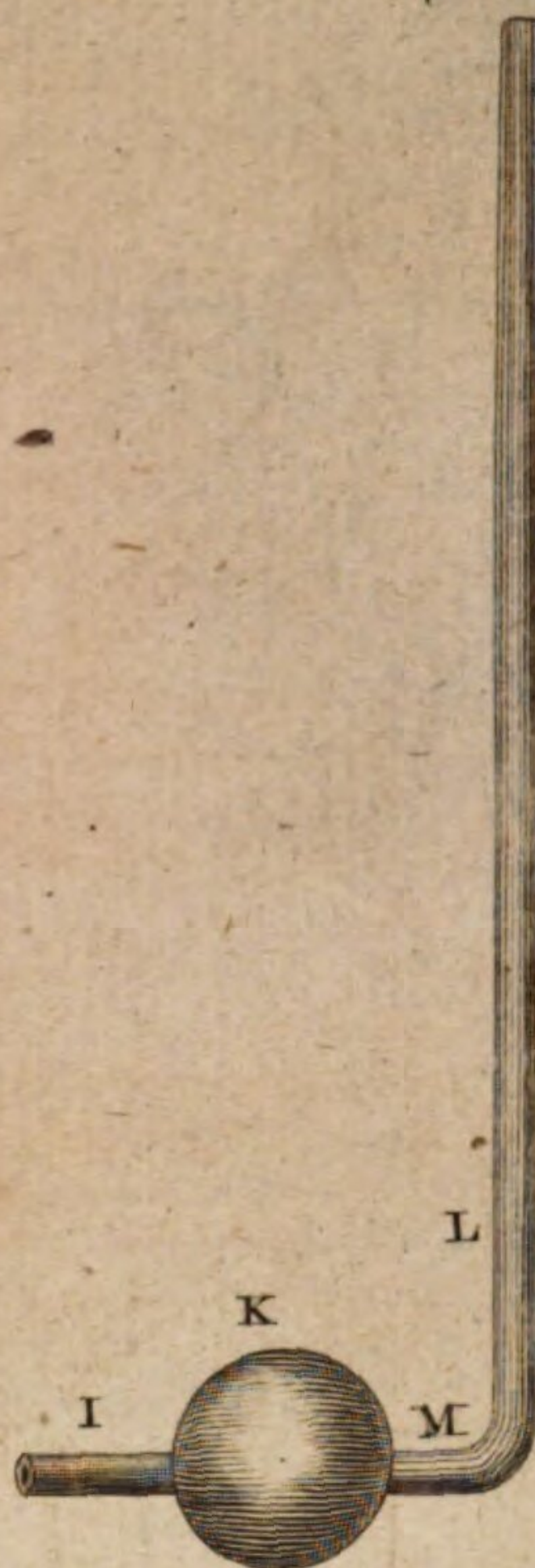
Fig. 86.



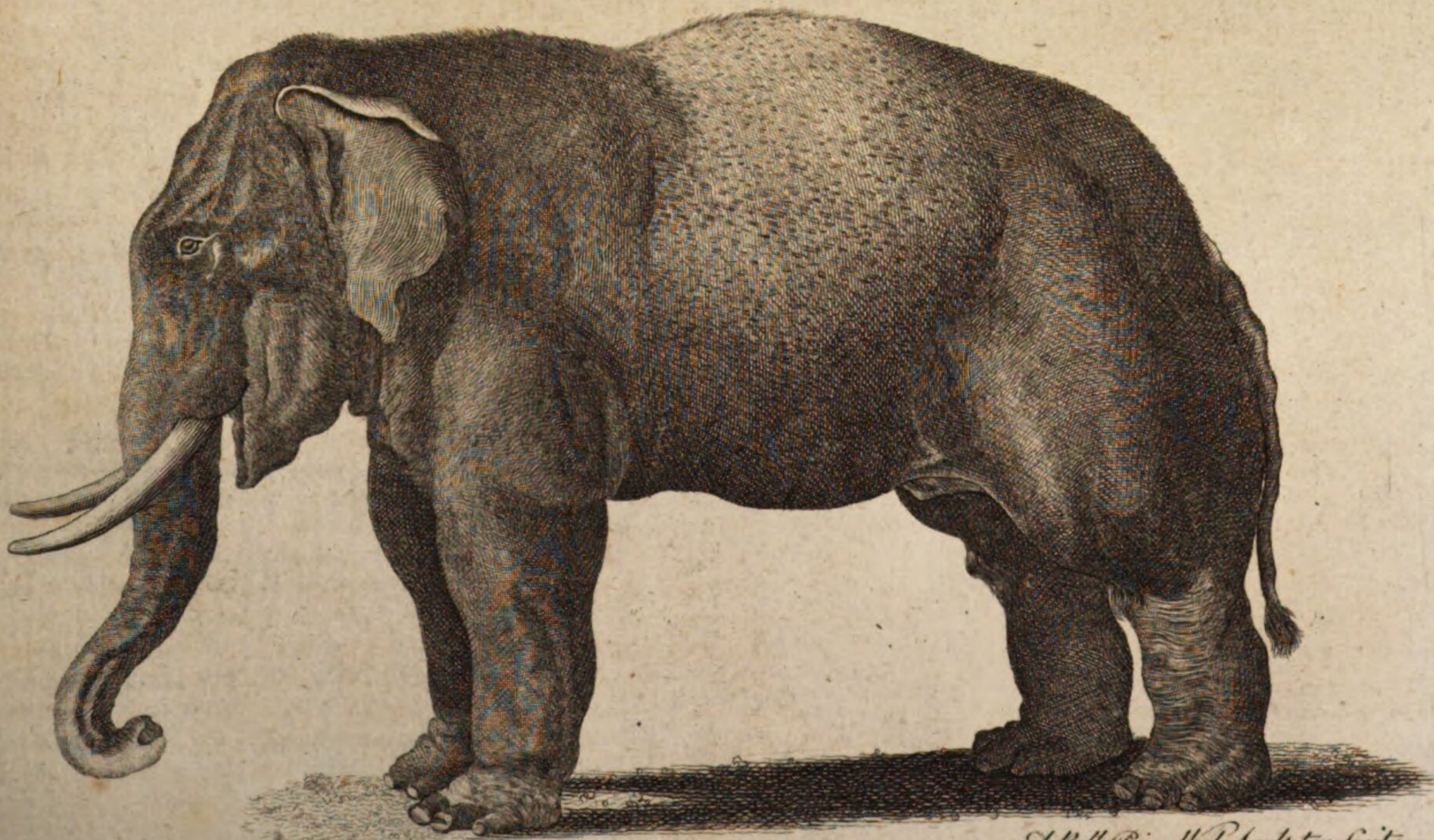
Fig. 85.



Fig. 81.



Elephas.



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this subject. 1. In all cases where the fluid is obliged to pervade the substance of any medium whatever, it moves with difficulty. Thus, if a vast quantity of electricity is sent through a small wire, the resistance it meets with is so great that the wire is dispersed with violence; and if the battery is large, it cannot be totally discharged, as was the case with Dr Van Marum's battery, mentioned n° 150. Again, if the spark be taken in water, a most violent explosion takes place; and yet both metals and water are good conductors of electricity. 2. In all cases where we set the electric fluid in motion, the utmost we can do is to give it a tendency to circulate; and unless we allow it to do so, no electricity will be produced. Thus, if we extricate the fluid from the earth by means of an electrical machine, discharge it upon a conductor, and form a communication between that and another part of the earth, the circulation will go on very readily, and the fluid will easily return to the place from whence it came. If the communication betwixt the earth and conductor be cut off by an electric, the circulation will nevertheless go on; the fluid will evaporate in the air, and from thence reach the earth by channels invisible to us. The effect will be the same in all cases where its motion in a certain direction is stopped: but what we call *stopping* it, is only rendering its passage more difficult in one particular place than in another; for as to any absolute stop or impediment, such as could resist the whole force of the fluid, as Mr Morgan supposes, there is not the least probability that it exists in nature. The whole that can be inferred from Mr Morgan's experiment therefore is, that the electric fluid will more readily evaporate and pass silently thro' the air than through a complete vacuum. The question, however, still recurs: Since this fluid passes very readily through rarefied air, why does it hesitate after a certain degree of rarefaction, and at last stop altogether when the air is totally exhausted? To this it may be replied, that when air is heated it becomes less electric than when cold, and by an increase of heat becomes at last an excellent conductor. On the other hand, by an increase of cold its electric properties become proportionably greater, and consequently the difficulty with which the fluid gets through it increases in proportion. Under the article *ELASTIC Vapours*, it is shown that

the true principle of elasticity is *heat*; and under the article *CHEMISTRY*, n° 99. it is shown, that heat and electricity are convertible into one another. In proportion as the air is rarefied, therefore, it absorbs heat, and consequently becomes a better conductor; but when it is totally exhausted, nothing remains but the fluid of electricity itself; the same indeed with that of heat, but deprived of motion, and consequently capable of making a much greater resistance. Now the strongest spark that can be drawn from any of our machines perhaps does not equal $\frac{1}{100}$ th of an inch in diameter, as appears from the holes made by them in paper or cards when pierced, as directed in Sect. VIII. But when a perfect vacuum is made, this small spark is obliged to act upon a cylinder of electric matter perhaps 6000 or 7000 times greater in diameter than itself, each point of which resists with the whole force the explosion itself has; and what is worse, the whole of this must be put in motion before any discharge can be made. The resistance therefore is so violent, that the fluid rather passes through the air as already explained: nevertheless, if it were possible to make a perfect vacuum of no greater diameter than that of the electric spark, there is no reason to suppose that it would not be penetrated by it; and of this Mr Morgan's experiments with the two wires above mentioned seems to be a confirmation.

On the whole, it is evident, that we cannot from this or indeed any other experiment argue against the possibility of the passage of the electric fluid from any part of the creation to another. We cannot force it, it is true, because it is disposed by its own natural laws to resist our efforts; but where it is disposed by these laws to yield in one place, there will undoubtedly be a current of it thither from some other, which we would find ourselves equally unable to stop by all the machines that ever have been or will be invented. There is as yet therefore not the least proof that the electric fluid does not pervade the most distant regions of space, and there perform all those great operations which have been ascribed to unknown and inexplicable powers. For a further account of the operations of this fluid in producing the phenomena of nature, see the articles *ATMOSPHERE*, *AURORA Borealis*, *EARTHQUAKE*, *HAIL*, *HURRICANE*, *LIGHTNING*, *METEOR*, *RAIN*, *SNOW*, &c.

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E L E

E L E

Electrides II *Electuary*. **ELECTRIDES**, anciently islands in the Adriatic sea, which received their name from the quantity of amber (*electrum*) which they produced. They were at the mouth of the Po, according to Apollonius of Rhodes, but some historians doubt of their existence.

ELECTROMETER. See **ELECTRICITY**, n° 27.

ELECTROPHORUS. *Ibid.* n° 16.

ELECTRUM, in natural history. See **AMBER**.

ELECTUARY, in pharmacy, a form of medicine composed of powders and other ingredients, incorporated with some conserve, honey, or syrup; to be divided into doses, like boluses, when taken.

Vossius observes, that all the remedies prescribed for the sick, as well as the confections taken by way of regale, were called by the Greeks *ἐκλεισματά*, and *ἐκλεκτά*, of the verb *λέγω*, "I lick;" whence, says he, was form-

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ed the Latin *electarium*, and afterwards *electuarium*. This Eleemosyna conjecture he supports from the laws of Sicily, where it is ordained, that *electuaries*, syrups, and other remedies, be prepared after the legal manner. The Bollandists, who relate this etymology, seem to confirm it. For the composition and different sorts of electuaries, see **PHARMACY**.

ELEEMOSYNA *Carucarum*, or *pro Aratri*, or *A-ratri*, in our ancient customs, a penny which king Ethelred ordered to be paid for every plough in England towards the support of the poor. Sometimes it is also called *eleemosyna regis*, because first appointed by the king.

ELEEMOSYNARIUS, in our our old writers, is used for the almoner or peculiar officer who received the eleemosynary rents and gifts, and distributed them

Elegance to pious and charitable uses. There was such an officer in all religious houses. The bishops also used to have their almoners, as now the king has.

Elements.

ELEGANCE, (from *eligo* "I choose,") denotes a manner of doing or saying things politely, agreeably, and with choice. With choice, so as to rise above the common manners; politely, so as to strike people of delicate taste; and agreeably, so as to diffuse a relish which gratifies every body.

ELEGANCE, in oratory and composition, an ornament of politeness and agreeableness shown in any discourse, with such a choice of rich and happy expressions, as to rise politely above the common manners, so as to strike people of a delicate taste.

It is observed, that elegance, though irregular, is preferable to regularity without elegance: that is, by being so scrupulous of grammatical construction, we lose certain licences wherein the elegance of language consists.

ELEGIAC, in ancient poetry, any thing belonging to elegy. See **ELEGY**.

ELEGIT, in law, a writ of execution, which lies for a person who has recovered debt or damages; or upon a recognizance in any court, against a defendant that is not able to satisfy the same in his goods.

ELEGY, a mournful and plaintive kind of poem. See the article **POETRY**.

ELEMENTS, in physics, the first principles of which all bodies in the system of nature are composed.

These are supposed to be few in number, unchangeable, and by their combinations to produce that extensive variety of objects to be met with in the works of nature.

That there is in reality some foundation for this doctrine of elementary bodies is plain; for there are some principles evidently exempted from every change or decay, and which can be mixed or changed into different forms of matter. A person who surveys the works of nature in an inattentive manner, may perhaps form a contrary opinion, when he considers the numerous tribes of fossils, plants, and animals, with the wonderful variety that appears among them in almost every instance. He may from thence be induced to conclude, that nature employs a vast variety of materials in producing such prodigious diversity. But let him inquire into the origin of this apparent diversity, and he will find that these bodies which seem the most different from each other are at bottom nearly the same. Thus the blood, chyle, milk, urine, &c. as well as the various solid parts of animals, are all composed of one particular substance; grass, for instance, by the assistance of air and water, and even sometimes of very insipid kinds of grass. The same simplicity presents itself in the original composition of the nourishment of vegetables, notwithstanding the variety among them with respect to hardness, softness, elasticity, taste, odour, and medical qualities. They chiefly depend, for these, upon water and the light of the sun; and the same simplicity must take place in animals that are fed on vegetables. The analysis of animal substances confirm this hypothesis; for they can all be reduced into a few principles, which are the same in all, and only differ with regard to the proportions in which they are combined. With regard to animals, the case

appears to be the same: and the more we are acquainted with them, the more reason we have to believe that the variety in their origin is very small.

Notwithstanding the infinite variety of natural productions, therefore, it appears, that the materials employed in their production are but few; that these are uniformly and certainly the same, totally exempted from any change or decay; and that the constant and gradual change of one body into another is produced by the various separations and combinations of the original and elementary parts, which is plain from the regularity and uniformity of nature at all times. There is a change of forms and combinations through which it passes, and this has been the case from the earliest accounts of time; the productions of nature have always been of the same kind, and succeeded one another in the same order. If we examine an oak, for instance, we find it composed of the same matter with that of any other that has existed from the earliest ages. This regularity and uniformity in the course of nature shows that the elementary parts of bodies are permanent and unchangeable; for if these elementary particles which constituted an oak some thousand years ago, had been undergoing any gradual decay, the oaks of the present times would have been found considerably different from those that existed long ago; but as no difference has been observed, it would seem that the ultimate elements of bodies have always continued the same.

Reflections of this kind have suggested an idea of several principal elements of which all other bodies are composed, which by their various combinations furnished all the variety of natural bodies. Democritus, and other great philosophers of antiquity, fixed the number to four, which have retained the name of elements ever since. These are, fire, air, earth, and water; each of which they imagined was naturally disposed to hold its own place in the universe. Thus, the earth, as heaviest, naturally tended towards the centre, and occupied the lower parts; the water, as approaching next to it in gravity, was spread chiefly on the outside of the earth; the air, being more subtile and rare, occupied the middle place; while the fire, being still more subtile and active, receded to the greatest distance of all, and was supposed to compose the planets and stars. This system was extended to all the productions of nature. Meteors were produced from a combination of fire and air; animals were considered as composed of earth and water; and those that were warm had likewise a proportion of the element of fire. Thus they went on, explaining some of the most striking qualities of the several productions of nature from the different proportions of the four elements they contained.

But though this system appears not at all destitute of beauty and propriety, and on this account has been in some measure received even to the present time, we find reason to doubt whether these four substances be really elementary bodies; nor do they answer our purpose in forming a system, as we know too little of the intimate structure and texture of them to enable us to explain other bodies by them.

Any other attempts that have been made to assign the number of elementary bodies have been much less fortunate. The chemists, with Paracelsus at their head, pretend

pretend

Elements. pretend to speak of four elementary bodies, salt, sulphur, earth, and mercury: but when we attempt to form an idea of what they mean, we find it very perplexed; and that the expressions concerning them are enveloped in so much obscurity, that they cannot be comprehended; and the theory is built entirely upon experiments made on metallic substances.

Under the article CHEMISTRY, n° 26. we have shown, that the elements, whatever they are, must necessarily be invisible or imperceptible by any of our senses. An inquiry into their number or properties therefore must be attended with very little success; and all the knowledge we can have upon the subject must be drawn from a view of their combinations, and reasoning analogically from the transmutations we observe to take place in nature. The modern discoveries in aerology have enabled us to proceed farther in this way than what it was possible for the ancient philosophers to do. We now find that all the different kinds of air are composed of that invisible and subtile fluid named *heat*, united in a certain way with some other substance: by which union the compound acquires the properties of gravitation, expansion, rarefaction, &c. for pure heat, unless when united with some terrestrial substance, neither gravitates nor expands. This is evident from the phenomena of the burning-glass, where the light concentrated in the focus will neither heat the air nor water, unless it meets with something with which it can form a permanent union. Heat therefore is justly to be considered as one of the original elements; being always capable of uniting with bodies, and of being extricated from them unchanged; while the same bodies are by their union with it changed into various forms; water, for instance, into ice or vapour, both of which return into their original state by the abstraction or addition of heat in a certain degree. Hence it becomes almost natural to conclude, that there are only two elements in the universe: and this opinion we find adopted by several philosophers, particularly the Count de Tressan in his Essay on the Electric Fluid. According to this doctrine, two primitive material substances seem to exist in nature; one that incessantly acts, and to which it is essential to be in motion; the other absolutely passive, and whose nature it is to be inert, and move entirely as directed by the former. Should this doctrine be adopted, little difficulty would occur in determining the active matter to be that universal fluid which in its various modifications of light, heat, and electricity, has such a share in the operations of nature. But in fixing on the passive element we are greatly embarrassed; nor are the discoveries in aerology or any other science as yet able to remove the difficulty entirely. In our experiments on this and some other parts of chemistry, we find three things that seem to be unchangeable, viz. earth; phlogiston; and that invisible, though terrestrial and gravitating principle called by the antiphlogistians the *oxygenous* or acidifying principle, and by the phlogistians the basis of dephlogisticated air. In our experiments on the first, we find that earth, though vitrified by the most intense fire, may be recovered in its proper form; and some very pure earths, particularly magnesia alba, cannot be changed even in the focus of the most powerful mirror. In like manner we may dissipate charcoal in *vacuo* by the solar rays, and the compound is inflammable air: we may decompose

this compound by a metallic calx, and we have our *Elements.* charcoal again unchanged, for all metals contain charcoal in substance. Let us try to destroy it by common fire, and we have it then in the fixed air produced, from which it may be recovered unchanged by means of the electric spark. With the basis of dephlogisticated air the case is still more difficult; for we cannot by any means procure a sight of it by itself. We may combine it with heat, and we have dephlogisticated air; to the compound we may add charcoal, and we have fixed air; by decomposing the former by burning iron in it, we have the metal greatly increased in weight by some unknown substance; and if we attempt to separate the latter, we have water, or some kind of vapour, which still conceals it from our view.

In some experiments made by Mr Watt, and of which an account is given under the article ACID, n° 12. we find that nitrous acid might be phlogisticated by the purest earth or metallic calx; whence it is not unreasonable to suppose that phlogiston may be only a certain modification of earth, and not an element distinct from it: but with regard to the basis of dephlogisticated air, no experiment has ever shown that it can either be procured by itself, or changed into any other substance; so that it appears to have the nature of an element as much as light or heat. Though we should therefore be inclined to divide the whole matter of the universe into two classes, the one active and the other acted upon, we must allow that the passive matter even on this earth is not precisely of the same kind: much less are we to extend our speculations in this respect to the celestial regions; for who can determine whether the substance of the moon is the same with that of our earth, or that the elements of Jupiter are the same with those of Saturn? There is even a difficulty with regard to the division which seems so well established, viz. of matter in general into active and passive; for no person can prove, that the matter which is active in one case may not be passive in another, and occasionally resume its activity. Something like this certainly happens in the case of the electric fluid, which is modified into heat or light, according to different circumstances; and we cannot know but it is the very same substance that constitutes the most solid bodies. This opinion at least did not seem absurd to Sir Isaac Newton, who proposed it as a query, Whether gross bodies and light were not convertible into one another? The end of our inquiries on this subject therefore must be, That the universe may be composed of many elements, or of one element; and of the nature of these elements, or of the single one, we know nothing.

ELEMENT, in a figurative sense, is used for the principles and foundations of any art or science; as Euclid's Elements, &c.

ELEMENTS, in astronomy, are those principles deduced from astronomical observations and calculations, and those fundamental numbers which are employed in the construction of tables of the planetary motions. Thus, the elements of the theory of the sun, or rather of the earth, are his mean motion and eccentricity, and the motion of the aphelia. The elements of the theory of the moon are its mean motion; that of its node and apogee, its eccentricity, the inclination of its orbit to the plane of the ecliptic, &c.

Elemi

Elephanta.

ELEMI, or ELEMV, in the materia medica. See

AMYRIS.

ELENCHUS, in antiquity, a kind of ear-rings set with large pearls.

ELENCHUS, in logic, by the Latins called *argumentum* and *inquisitio*, is a vicious or fallacious argument, which deceives under the appearance of a truth; the same with what is otherwise called *sophism*.

ELEPHANT, in zoology. See ELEPHAS.

American ELEPHANT: An animal only known in a fossil state, and that but partially, from the teeth, some of the jaw-bones, the thigh-bones, and vertebræ, found with many others five or six feet beneath the surface on the banks of the Ohio. But these bones differ in several respects from those of the elephant; for which, see *Fossil Bones*. As yet the living animal has evaded our search. Mr Pennant thinks it "more than probable, that it still exists in some of those remote parts of the vast new continent unpenetrated yet by Europeans. Providence maintains and continues every created species; and we have as much assurance that no race of animals will any more cease while the earth remains, than *seed-time and harvest, cold and heat, summer and winter, day or night*. See MAMMUTH.

ELEPHANT-Beetle. See SCARABÆUS.

Knights of the ELEPHANT, an order of knighthood in Denmark, conferred upon none but persons of the first quality and merit. It is also called the *order of St Mary*. Its institution is said to have been owing to a gentleman among the Danish croises having killed an elephant, in an expedition against the Saracens, in 1184; in memory of which, king Canutus instituted this order, the badge of which is a towered elephant, with an image of the holy virgin encircled with rays, and hung on a watered sky-coloured ribbon, like the George in England.

ELEPHANTA, a small, but very remarkable island about five miles from the castle of Bombay in the East Indies. Of this we have the following description in Mr Grose's Voyage to the East Indies. "It can at most be but about three miles in compass, and consists of almost all hill: at the foot of which, as you land, you see, just above the shore, on your right, an elephant, coarsely cut out in stone, of the natural bigness, and at some little distance not impossible to be taken for a real elephant, from the stone being naturally of the colour of that beast. It stands on a platform of stones of the same colour. On the back of this elephant was placed, standing, another young one, appearing to have been all of the same stone, but has been long broken down. Of the meaning, or history, of this image, there is no tradition old enough to give any account. Returning then to the foot of the hill, you ascend an easy flant, which about half way up the hill brings you to the opening or portal of a large cavern hewn out of a solid rock, into a magnificent temple: for such surely it may be termed, considering the immense workmanship of such an excavation; and seems to me a far more bold attempt than that of the pyramids of Egypt. There is a fair entrance into this subterraneous temple, which is an oblong square, in length about 80 or 90 feet, by 40 broad. The roof is nothing but the rock cut flat at top, and in which I could not discern any thing that did not show it to be all of one piece. It is about 10 feet high, and supported towards the middle, at equidistance from the

sides and from one another, with two regular rows of Elephanta pillars of a singular order. They are very massive, short in proportion to their thickness, and their capital bears some resemblance to a round cushion pressed by the superincumbent mountain, with which they are also of one piece. At the further end of this temple are three gigantic figures; the face of one of them is at least five feet in length, and of a proportionable breadth. But these representations have no reference or connection, either to any known history or the mythology of the Gentoos. They had continued in a tolerable state of preservation and wholeness, considering the remoteness of their antiquity, until the arrival of the Portuguese, who made themselves masters of the place; and in the blind fury of their bigotry, not suffering any idols but their own, they must have even been at some pains to maim and deface them, as they now remain, considering the hardness of the stone. It is said they even brought field-pieces to the demolition of images, which so greatly deserved to be spared for the unequalled curiosity of them. Of this Queen Catherine of Portugal was, it seems, so sensible, that she could not conceive that any traveller would return from that side of India without visiting the wonders of this cavern; of which too the sight appeared to me to exceed all the descriptions I had heard of them. About two-thirds of the way up this temple, on each side, and fronting each other, are two doors or outlets into smaller grots or excavations, and freely open to the air. Near and about the door-way, on the right-hand, are several mutilated images, single and in groupes. In one of the last, I remarked a kind of resemblance to the story of Solomon dividing the child, there standing a figure with a drawn sword, holding in one hand an infant with the head downwards, which it appears in act to cleave through the middle. The outlet of the other on the left hand is into an area of about 20 feet in length and 12 in breadth; at the upper end of which, as you turn to the right, presents itself a colonade covered at top, of 10 or 12 feet deep, and in length answering to the breadth of the area: this joins to an apartment of the most regular architecture, an oblong square, with a door in perfect symmetry; and the whole executed in quite a contrary taste and manner from any of the oldest or best Gento buildings any where extant. I took particular notice of some paintings round the cornices, not for any thing curious in the design, but for the beauty and freshness of the colouring, which must have lasted some thousands of years, on supposing it, as there is all reason to suppose it, cotemporary with the building itself. The floor of the apartment is generally full of water, its pavement or ground-work not permitting it to be drawn off or to be soaked up. For it is to be observed, that even the cavern itself is not visitable after the rains until the ground of it has had time to dry into a competent hardness."

ELEPHANTIASIS, called also the *lepra of the Arabians*, in medicine, a chronical disease, one of the two species of leprosy which affects the whole body, where even the bones as well as the skin are covered with spots and tumors, which being red at last turn black. See MEDICINE-Index.

ELEPHANTINE, or ELEPHANTIS (anc. geog.), an island in the Nile to the south of Syene; with a cognominal town, where the navigation on the Nile ends, because

Elephantine.

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Elephas.

because just below the less cataract. And here to the west of the Nile stood the last Roman garrison (Notitia Imperii).

ELEPHANTINE, in Roman antiquity, an appellation given to the books wherein were registered the transactions of the senate and magistrates of Rome, of the emperors or generals of armies, and even of the provincial magistrates; the births and classes of the people, and other things relating to the census.

They are supposed to have been so called, as being made of leaves of ivory or elephants tusks.

ELEPHANTOMACHI. See ETHIOPIA.

ELEPHANTOPUS, in botany: A genus of the polygamia segregata order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Compositae*. The calyculus is quadriflorus, with hermaphrodite florets ligulated or plane; the receptacle is naked; the pappus bristly.

ELEPHAS, the ELEPHANT, in zoology, a genus of quadrupeds belonging to the order of bruta. The characters are these: The elephant has no foreteeth in either jaw, and the dog-teeth are very long: the proboscis or trunk is long, and capable of laying hold of any thing; and the body is somewhat naked.

The elephant is the largest of all land-animals. From the front to the origin of the tail he is generally about 16 feet long, from the end of the trunk 25 feet, and about 14 feet high. The circumference of the neck is 17 feet, and the circumference of the body at the grossest part 25 feet 10 inches; the tail is about 6 feet long, and $2\frac{1}{2}$ in circumference. The circumference of the legs is about 6 feet. These are the largest dimensions. But the animal differs in size in different countries; in some not exceeding 7 feet in height. The eyes are small in proportion to the size of the animal. The muzzle is very different from that of any other quadruped; it is nothing but the origin of a long trunk which hangs between the two large tusks; the mouth appears behind the trunk, which serves in place of an upper lip, and the under lip terminates in a point. The feet are short, round, clumsy, and only distinguishable by the toes. The trunk is, properly speaking, the nose extended, and terminated by a couple of nostrils. But, besides serving as an organ of smell, the trunk performs all the functions of a strong and dexterous arm. The trunk of an elephant is about 8 feet long, $5\frac{1}{2}$ feet in circumference near the mouth, and one foot and a half near the extremity: it is a pipe of an irregular conical figure, and widened at the end: the superior side of the trunk is convex, and furrowed transversely; and the inferior side is flat, and has two longitudinal rows of small protuberances resembling the tentacula of the silk-worm and most other caterpillars. The upper part of the trunk corresponds with the extremity of the nose in other quadrupeds, and answers the same intention; the inferior part serves as an upper lip, including the nostrils at the same time. For the trunk is a continued canal, divided into two cavities by a longitudinal partition: these cavities ascend along the forepart of the upper jaw, where they make a turn inward, and descend into the palate, and then terminate in two separate orifices; they have likewise each a separate orifice at the end of the trunk. At the place where these cavities make a turn, and before they enter into the bones of the head, there is a moveable cartilaginous plate situated in such a manner

as enables the animal to shut the canal, and to prevent the water with which it occasionally fills the trunk from entering into the passage of the nose where the organs serving for the sensation of smell are placed. The elephant can move the trunk in all directions; he can extend or shorten it at pleasure, without altering the diameters of the two canals within. By this means respiration is not interrupted, whatever be the situation of the trunk; and the water is allowed to remain till the animal chooses to throw it out by an expiration. Each canal is lined with a smooth strong membrane, and the surface of the trunk is covered with another strong membrane or skin. The substance contained between the exterior and interior membranes, is a composition of longitudinal and transverse muscles, which serve to extend and contract the length of the trunk. At the extremity of the trunk there is a concave protuberance, in the bottom of which are the two passages of the nostrils. The inferior part of the protuberance is thicker than the sides, and the superior part is stretched out like a finger about five inches long; which, together with the edges of the whole extremity of the trunk, takes on different figures according to the necessities of the animal. It is by this organ that the animal lays hold of food or other substances; which he manages with as much dexterity as a man does his hand, taking up grains of corn, or the smallest piles of grass, and conveying them to his mouth. When he drinks, he thrusts his trunk into the water, and fills it by drawing in his breath and exhausting the air: when the trunk is thus filled with water, he can either throw it out to a great distance, or drink it by putting the end of the trunk in his mouth.

The two large tusks, which some call the *horns* of the elephant, are of a yellowish colour, and extremely hard. The bony substance of which they are composed is known by the name of *IVORY*, and much used in different branches of manufacture.

The ears are very large, and resemble those of an ape. The skin of the elephant has but few hairs on it, and placed at great distances from each other. It is full of wrinkles, like those on the palm of a man's hand, besides many chapped and greasy ridges. The female has two dugs, one on each side of the breast.

M. Buffon supposed the ancients to have been "deceived, when they tell us, that the elephants copulate like other quadrupeds, the female only lowering her crupper for the more easy reception of the male. The situation of the parts seems to render this mode of junction impossible. The female elephant has not like other quadrupeds the orifice of the vagina adjacent to the anus; for it is situated nearly in the middle of the belly, about two and a half or three feet distant from the anus. On the other hand, the male organ is by no means proportioned to the magnitude of his body, nor to so long an interval, which in the situation supposed would preclude the practicability of his approach. Naturalists as well as travellers agree in affirming, that the male organ of the elephant exceeds not either in length or diameter that of a horse. It is, therefore, impossible that he should attain his end in the ordinary position of quadrupeds. The female must necessarily lie on her back. De Feynes and Tavernier positively assert, and the situation of the parts confirms their evidence, that these animals cannot intermix in

Elephas.

Elephas

any other manner. They require, therefore, more time and conveniency for this operation than other quadrupeds; and it is perhaps for this reason that they never copulate but when they enjoy full liberty, and have every necessary article at their command. The female must not only consent, but solicit the male, by a position which she never assumes unless when she thinks herself in perfect retirement." The fact, however, has been controverted by others. Dr Sparrman informs us, that in order if possible to determine the question, he let slip no opportunity of interrogating on the subject every elephant-hunter he met with at the Cape; who all agreed in replying that they were most inclined to the common opinion, if they had not been differently informed by two of their companions, Jacob Kok and Marcus Potgieter, who had actually seen elephants copulate. "I met (says our author) only with the former of these hunters, who told me he had likewise himself been of opinion that the female was obliged to lie on her back on this occasion; till at length, being out along with Potgieter hunting of elephants, he had occasion to think otherwise. On a certain spot they came to, they could reckon about eight elephants, which, on account of the small size of their tusks, they took for females, excepting two large ones; which making several circles round one of these that they took for females (the only one perhaps in rut) frequently, in all probability by way of caressing her, struck her with their trunks, till at length she threw herself down upon her knees, and keeping the spine of her back in a stiff and extended position, brought her hind-feet quite close to her fore-feet, or somewhat beyond them; so that she almost as it were stood upon her head. In this forced posture they saw her wait a long while together for the caresses of the males, who, in fact, likewise endeavoured to perform the matrimonial rites, but from jealousy hindered each other whenever either of them began to mount. After two hours had thus elapsed, the patience of our hunters began to tire; and the rather, because on account of the uneven and stoney nature of the ground, which, however, had no wood upon it, and of a river being between them, they could not dare to advance and fire at these animals. I will not dissemble, that though I have not the least occasion to doubt the veracity of my informer, and though what he told me is by no means impossible, I yet find great difficulty in this matter. But on the other hand, the same may be said of M. Buffon's or the common opinion; first, as they have not been able to confirm it by the testimony of any eye-witness, nor even by any instance of this kind in other quadrupeds properly so called; that is, in such animals as have some degree of affinity with elephants; secondly, as the female's lying on her back can hardly be more convenient for the male, especially as the vagina, according to what I am told, goes from the fore-part backwards; thirdly, it is besides well known, that the older elephants, on account of the unwieldiness of their bodies, chiefly stand when they sleep, in order to avoid the trouble and difficulty of lying down and getting up again. Tavernier, indeed, in his third volume, informs us, that the tame females when in rut make themselves a kind of bed, and lay themselves in it on their backs, at the same time inviting the male elephant by a peculiar cry, &c. but as the author did not see this himself, and that besides it

is entirely contrary to the modesty and dislike to copulation for which the female elephants have always been remarked, I cannot do otherwise than leave M. Tavernier's relation and different opinions touching the subject to the test of future experience."

Mr J. C. Wolf, however, in his Voyage to Ceylon lately published, confirms the common opinion, and gives an account of the operation in question as if he had more than once seen it performed. "The male (he informs us) makes a pit or hollow in the ground, and assists his consort to lay herself on her back; and in case he finds her perfectly compliant and agreeable, very complaisantly helps her up again after the business is finished (for she cannot possibly rise of herself), by throwing his trunk round her neck: but if she at first stood shilly-shally, and gave herself prudish airs, he then even lets her lie, and goes about his business." But concerning the credit due to this author, the public seem not to be agreed. On the other hand, M. Buffon, in his Supplement, has retracted his former opinion, upon the authority of M. Bles (secretary during 12 years to the Dutch government in Ceylon); who describes the copulation of these animals in the same manner as Farmer Kok does in the extract above given from Dr Sparrman. "Having perceived (says M. Bles) that the Count de Buffon, in his excellent work, is deceived with regard to the copulation of the elephants, I know, that in several parts of Asia and Africa these animals, especially during the season of love, remain almost in the most inaccessible places of the forests; but in the island of Ceylon, where I lived 12 years, the land being every where inhabited, they cannot so easily conceal themselves; and having often examined them, I perceived that the female organ is situated nearly under the middle of the belly, which would lead us to think, with M. Buffon, that the males cannot cover the females in the manner of other quadrupeds. However, there is only a slight difference of situation. When they inclined to copulate, I perceived that the female bowed down her head and neck, and leaned her two fore-legs, which were also bended, upon the root of a tree, as if she meant to prostrate herself on the ground; and the two hind-legs remained erect, which gave the male an opportunity of embracing her as other quadrupeds do. I can likewise affirm, that the females go with young about nine months. Moreover, the elephants never copulate unless when in a state of freedom. In the season of love, the males are strongly chained for four or five weeks, during which time they discharge vast quantities of semen, and are so furious, that their cornacks or governors cannot come near them without danger. The approach of the rutting season is easily known; for some days before it happens, an oily liquor flows from a small hole on each side of the head. The domestic female on these occasions sometimes makes her escape, and joins the wild males in the woods. Some days afterward, her cornack goes in quest of her, and calls her by her name till she comes. She submits to him with complacence, and allows herself to be conducted home, and shut up in the stable. It was from cases of this kind that it was discovered that the females bring forth about the end of nine months."—The first remark, with regard to the mode of copulating, M. Buffon thinks unquestionable, since M. Marcel Bles assures us that he has seen the elephants perform the operation. But as to the

Elephas

Elephas. time of gestation, which he limits to nine months, we ought to suspend our judgment, because all travellers affirm that the female elephant is believed to go with young no less than two years.

Elephants, even in a savage state, are peaceable and gentle creatures. They never use their weapons but in defence of themselves or companions. Their social dispositions are so strong, that they are seldom found alone, but march always in large troops: the oldest and most experienced lead the van; the younger, or lame ones, keep in the middle; and those of a second rate, as to age, walk in the rear. The females carry their young on their tusks, embracing them at the same time with their trunk. They seldom march in this regular order but when they reckon the journey dangerous, such as an expedition to cultivated lands, where they expect to meet with resistance. On other occasions they are less cautious; some of them falling behind or separating from the rest, but seldom so far as to be without the reach of assistance by alarming and assembling their companions. It is dangerous to offer them the least injury; for they run straight upon the offender; and although the weight of their body be great, their steps are so large, that they easily outrun the swiftest man, whom they either pierce with their tusks, or seize with their trunk, dart him in the air like a stone, and then trample him under their feet. But they never attack any person unless when provoked. However, as they are extremely sensible and delicate with regard to injuries, it is always prudent to keep out of their way. Travellers who frequent these countries kindle large fires, and beat drums during the night, in order to prevent their approach. After being once attacked by men, or falling into any ambush, they are said never to forget the injury, but search for every opportunity of getting revenge. As they are endowed perhaps with a more exquisite sensation of smell than any other animal, owing to the great extent of their nose, they can scent a man at a very great distance, and trace him by his footsteps.

Elephants are peculiarly fond of the banks of rivers, deep valleys, and marshy grounds, especially when well shaded with trees. They delight in drawing up water into their trunks, even when they do not drink it, and amuse themselves in dashing the water around. They cannot endure cold, and are equally averse to an excess of heat: in order to avoid the scorching heat of the sun, they retire to the thickest and most shady parts of the forest. The bulk of their bodies is so enormous, that they do not choose to go into deep waters so frequently as some other quadrupeds; although the length of their trunk, which they raise straight up, and by which they respire, is a great advantage in swimming.

The ordinary food of elephants is roots, herbs, leaves, the tender branches of trees, fruits, and grains: but they abhor flesh or fish. When any of them discovers a fine pasture, he immediately calls and invites his companions to come and eat with him. As they devour a large quantity of food in a short time, they

are always shifting their pasture; when they meet with cultivated grounds, they make a prodigious desolation, and destroy more plants by their feet than they use for nourishment: which last is very considerable, amounting to 150 pounds of herbage every day: by this means, as they constantly graze in large troops, they lay waste whole fields in an hour. The Indians and negroes employ every art to prevent them from visiting their cultivated lands, making great noises, and burning large fires round their fields. However, these precautions are not always sufficient to prevent the elephants from visiting them. They chase away the domestic animals, put the men to flight, and sometimes even throw down their limber huts. Elephants are hardly susceptible of fear: the only things which can surprise them or stop their course are artificial fires, such as squibs, crackers, &c. the effects of which are so sudden and so quickly repeated, that the elephants frequently turn back; and when one runs, all the rest instantly follow his example.

Although the social disposition in the elephant be exceeding strong; yet whenever the females come in season, it immediately gives place to the stronger and more interesting passion of love. They observe the greatest delicacy in their amours, abhorring nothing so much as to be seen by their companions. The troop divide themselves into couples, steal off into the most secret places of the forest, and then give way to all the impulses of nature, which are lively and lasting in proportion to the long period of abstinence; for, according to all accounts, except that of M. Bles already noticed (A), the female goes with young two years, and it is only once in three years that the season of love returns. They bring forth but one at a time; which, as soon as it comes into the world, is as large as a wild boar, and is furnished with teeth: however, the large tusks do not make their appearance till some time after, and at the age of six months they are several inches long. Elephants of this age are as large as an ox when in a natural state.

The manner of taking and taming elephants, therefore, merits our attention. In forests and such places as are frequented by elephants, the Indians choose a spot and inclose it with strong palisades; they use the largest trees as the principal stakes, to which are fixed smaller ones in a transverse direction. These cross trees are fixed so as to allow a man to pass easily through. There is likewise a large port left for the elephant, over which is suspended a strong barrier, which is let down as soon as he enters. In order to decoy him into the inclosure, the hunters take along with them a tame female in season, and travel about till they come so near as that the cry of the female can reach a male, whom they previously observe in the forest; then the guide of the female makes her give the cry peculiar to the season of love: the male instantly replies, and sets out in quest of her. The guide then makes the female proceed towards the artificial inclosure, repeating her cries from time to time as she goes along. She enters into

(A) Mr Bles's information is adopted by Mr Pennant: That they go only nine months with young, he says, is guessed by the casual escape of the tame females, when in rut, into the woods; where they couple with the wild; are soon discovered and brought back, and observed to bring forth in about nine months from the time.

Elephas. into the inclosure, the male follows her, and the Indians immediately shut the port behind him. He no sooner discovers the hunters, and that he is inclosed, than his passion for the sex is converted into rage and fury. The hunters entangle him with strong ropes; they fetter his legs and trunk; they bring two or three tame elephants in order to pacify and reconcile him to his condition. In a word, they reduce him to obedience in a few days, by a proper application of torture and caresses. There are many other methods of catching elephants. Instead of making large inclosures with pallisades, like the kings of Siam, and other monarchs, the poor Indians content themselves with a very simple apparatus: they dig deep pits in the roads frequented by elephants, covering them over with branches of trees, turf, &c. When an elephant falls into one of these pits, he is unable to get out again.

The elephant, when tamed, is the most friendly and obedient of all animals: he is entirely attached to the person who feeds and takes care of him. In a short time he understands signs, and the sound of his master's voice. He distinguishes the language of passion, of command, of satisfaction; and acts accordingly. He receives his orders with attention, and executes them with prudence and alacrity, but without precipitation. He easily learns to bow his knees and lower his body, for the convenience of those who mount him. He caresses his friends with his trunk. He lifts burdens with his trunk, and assists those who are loading him in laying them on his back. He delights in shining harness and trappings. When yoked in a cart or waggon, he pulls equally and cheerfully, unless he be abused by injudicious chastisements. His guide is generally mounted on his neck, with a small rod of iron sharp at the point in his hand; he directs his motion by pricking him on the ears and head; but, for the most part, a word is sufficient.

A tame elephant will do more labour than six horses; but then he requires a proportional quantity of food. They are the principal beasts of burden in many parts of Africa and the East Indies. They carry sacks and bundles of all kinds on their neck, back, and tusks. They never lose or damage any thing committed to their care: they will stand on the edge of a river, take bundles off their necks and tusks, lay them carefully in a boat wherever they are desired, and try with their trunk whether they are properly situated; if they be loaded with casks, they go in quest of stones to prop them and prevent them from rolling.

The elephant is not only the most tractable, but the most intelligent, of animals; sensible of benefits, resentful of injuries, and endowed even with a sense of glory.—In India, they were once employed in the launching of ships: one was directed to force a very large vessel into the water; the work proved superior to his strength: his master, with a sarcastic tone, bid the keeper take away this lazy beast and bring another: the poor animal instantly repeated his efforts, fractured his skull, and died on the spot. In Delli, an elephant passing along the streets, put his trunk into a taylor's shop, where several people were at work: one of them pricked the end with his needle: the beast passed on; but in the next dirty puddle filled his trunk with water, returned to the shop, and spouting every

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drop among the people who had offended him, spoilt their work. *Elephas.*

An elephant in Adsmear, which often passed thro' the bazar or market, as he went by a certain herb-woman, always received from her a mouthful of greens: at length he was seized with one of his periodical fits of rage, broke his fetters, and, running through the market, put the crowd to flight; among others, this woman, who in haste forgot a little child she had brought with her. The animal recollecting the spot where his benefactress was wont to sit, took up the infant gently in his trunk, and placed it in safety on a stall before a neighbouring house. Another, in his madness, killed his *cornac* or governor: the wife seeing the misfortune, took her two children and flung them before the elephant, saying, "Now you have destroyed their father, you may as well put an end to their lives and mine." It instantly stopped, relented, took the greatest of the children, placed him on its neck, adopted him for his *cornac*, and never afterwards would permit any body else to mount it. *Ibid.*

A soldier at Pondicherry, who was accustomed, whenever he received the portion that came to his share, to carry a certain quantity of it to one of these animals, having one day drank rather too freely, and finding himself pursued by the guards, who were going to take him to prison, took refuge under the elephant's body and fell asleep. In vain did the guard try to force him from this asylum, as the elephant protected him with his trunk. The next morning the soldier, recovering from his drunken fit, shuddered with horror to find himself stretched under the belly of this huge animal. The elephant, which without doubt perceived the man's embarrassment, caressed him with his trunk, in order to inspire him with courage and make him understand that he might now depart in safety. *Buffon, p. 78.*

A painter was desirous of drawing the elephant which was kept in the menagerie at Versailles in an uncommon attitude, which was that of holding his trunk raised up in the air with his mouth open. The painter's boy, in order to keep the animal in this posture, threw fruit into his mouth; but as the lad frequently deceived him, and made an offer only of throwing him the fruit, he grew angry; and, as if he had known that the painter's intention of drawing him was the cause of the affront that was offered him, instead of revenging himself on the lad, he turned his resentment on the master, and taking up a quantity of water in his trunk, threw it on the paper on which the painter was drawing, and spoiled it. *Mem. pour servir à l'Hist. des animaux, par Mef-sieurs de l'Acad. des Sciences, Part III.*

At the Cape of Good Hope, it is customary to kill those animals, for the sake of their teeth, by the chase. Three horsemen, well-mounted and armed with lances, attack the elephant alternately, each relieving the other as they see their companion pressed, till the beast is subdued. Three Dutchmen (brothers), who had made large fortunes by this business, determined to retire to Europe, and enjoy the fruits of their labours; but resolved, before they went, to have a last chase by way of amusement: they met with their game, and began the attack in the usual manner; but unfortunately one of their horses fell down and flung its rider: the enraged animal instantly seized the unhappy man with its trunk, flung him up to a vast height in the air, and received

Ludolph. com. in bist. Ethiop. p. 147.

Voyage de la Gaille, p. 160.

Elephas. received him on one of its tusks; then turning towards the two other brethren, as if it were with an aspect of revenge and insult, held out to them the impaled wretch writhing on the bloody tooth.

From the earliest accounts in history, the eastern nations have employed elephants in war; Alexander the Great was the first European who ever mounted an elephant. He carried a number of them into Greece, which Pyrrhus employed some years after against the Romans at the battle of Tarentum. Both the Greeks and Romans soon learnt to get the better of those monstrous animals: they opened their ranks and allowed them to pass through; neither did they attempt to hurt them, but threw darts, &c. at their guides. Now that fire-arms are the principal instruments of war, elephants, who are terrified at the noise and flame, instead of being useful, would only tend to embarrass and confuse an army. However, in Cochin and other parts of Malabar, as also in Tonquin, Siam, and Pegu, where fire-arms are little understood, they are still used in battle. The guide sits astride upon the neck, and the combatants sit or stand upon the other parts of the body. They are also extremely serviceable in fording of rivers, and carrying over the baggage on their backs. After the keepers have loaded them with several hundred weight, they fasten ropes to them; of which the soldiers taking hold, either swim or are drawn across the river. In time of action, they now and then fix an heavy iron chain to the end of their trunks, which they whirl round with such agility, as to make it impossible for an enemy to approach them at that time. Another use they still have for this creature in war, is to force open the gates of a city or garrison which is closely besieged. This he does by setting his backside against them, riggling backwards and forwards with his whole weight, till he has burst the bars, and forced an entrance: to prevent which, most of the garrisons in this country have large spikes stuck in their gates, that project to a considerable distance. However, after all, those prodigious animals are kept more for show and grandeur than for use, and their keeping is attended with a very great expence, for they devour vast quantities of provision; and you must sometimes regale them with a plentiful repast of cinnamon, of which they are excessively fond. It is said to be no uncommon thing with a Nabob, if he has a mind to ruin a private gentleman, to make him a present of an elephant, which he is ever afterwards obliged to maintain at a greater expence than he can afford: by parting with it, he would certainly fall under the displeasure of the grandee, besides forfeiting all the honour which his countrymen think is conferred upon him by so respectable a present.

When the elephant is properly managed, he lives very long even in a state of slavery and labour. That some have lived in this state 130 years, is pretty well authenticated. In a natural state, they often exceed 200 years, and propagate their species till they are 120: It is 30 years before they come to their full growth.

The elephant inhabits India, and some of its greater islands, Cochin China, and some of the provinces of China. It abounds in the southern parts of Africa, from the river Senegal to the Cape; and from thence as high as Ethiopia on the other side. They are found in the greatest numbers in the interior parts, where

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there are vast forests, near the sides of rivers. The wild elephants of Ceylon live in troops or families distinct and separate from all others, and seem to avoid the strange herds with particular care. When a family removes from place to place, the largest-tusked males put themselves at the head; and if they meet with a large river, are the first to pass it. On arriving on the opposite bank, they try whether the landing-place is safe: in case it is, they give a signal of a note from the trunk, as if it were the sound of a trumpet, on which the remaining part of the old elephants swim over; the little elephants follow, holding one another by locking their trunks together; and the rest of the old ones bring up the rear. In the woods are often seen a solitary male elephant, wandering like an outlaw banished from the herd and all the race. These are as if in a state of desperation, and very dangerous. A single man will put to flight whole herds of social elephants: this alone fears not his presence, but will stand firm, putting his power to defiance. Elephants are not at present domesticated in Africa, but only in the more civilized parts of Asia. They are much more numerous in Africa. In some parts they swarm so, that the negroes are obliged to make their habitations underground for fear of them. They are killed and eaten by the natives, and the trunk is said to be a delicious morsel. All the teeth are brought from Africa: they are frequently picked up in the woods; so that it is uncertain whether they are shed teeth, or those of dead animals. The African teeth which come from Mosambique are ten feet long; those of Malabar only three or four; the largest in Asia are those of Cochin China, which even exceed the size of the elephants of Mosambique. The skin is thick, and, when dressed, proof against a musket ball. The flesh, the gall, the skin, and the bones, are said to be used medicinally by the Chinese. See Plate CLXXX.

ELEVATION, the same with ALTITUDE or height.

ELEVATION of the Host, in the church of Rome, that part of the mass where the priest raises the host above his head for the people to adore.

ELEVATOR, in anatomy, the name of several muscles, so called from their serving to raise the parts of the body to which they belong.

ELEVATORY, in surgery, an instrument for raising depressed or fractured parts of the skull, to be applied after the integuments and periosteum are removed. See SURGERY.

ELEVE, a term purely French, though of late used also in our language. Literally it signifies a disciple or scholar bred up under any one, being formed from the Italian *allievo*, an "apprentice" or "novice."

It was first used by the French writers in speaking of painters; such a painter was an eleve of Da Vinci, of Raphael, &c. From painting it came to be applied to such as studied or learned any other art under a master. In the Royal Academy of Sciences, there were 20 eleves: and in that of inscriptions, 10 eleves. The eleves are to act in concert with the pensionaries. See ACADEMY.

The denomination *eleve*, however, has been since suppressed, and that of *adjoint* substituted in its room; because every body did not know the sense affixed to it by the academy: and now the pensionary academists have not, as formerly, each of them an eleve; but the

4 A

eleves

Elephas
||
Eleve.

Eleventh, *eleves* are become adjoints, or associates of the academy. *Eleufinia.* ELEVENTH, or chord of the eleventh. See IN-

TERVAL.

ELEUSINIA, in Grecian antiquity, a festival kept in honour of Ceres, every fourth year by some states, but by others every fifth. The Athenians celebrated it at Eleufis, a town of Attica; whence the name.

Ceres, fays an Athenian orator (Ifocrates), wandering in queft of her daughter Proferpine, came into Attica, where fome good offices were done her, which it is unlawful for thofe who are not initiated to hear. In return ſhe conferred two unparalleled benefits; to wit, the knowledge of agriculture, by which the human race is raifed above the brute creation; and the mysteries, from which the partakers derive ſweeter hopes than other men enjoy, both as to the preſent life and to eternity. It was the popular opinion, that the Eleufinian goddeſſes ſuggeſted prudent counſel to their votaries, and influenced their conduct; that theſe were reſpected in the infernal regions, and had precedence in the aſſemblies of the bleſſed; while the unhallowed were in utter darkneſs, wallowing in mire, or labouring to fill a leaky veſſel. The Athenians were ſolicitous to ſecure theſe advantages to their children, by having them initiated as ſoon as was allowed.

Ceres was ſuppoſed to be particularly partial to Eleufis and its vicinity. There were the memorials of her preſence and of her bounty; the well-named *Callichorus*, by which ſhe had reſted, in the reign of Erechtheus; the ſtone on which ſhe ſat, named *the ſorrowful*; the Rharian plain, where barley was firſt ſown; and the threshing-floor and altar of Triptolemus, a herdsman whom ſhe inſtructed in the culture of that grain, the uſe of which ſucceeded to acorns. Her mysteries continued to poſſeſs a pre-eminence in holineſs, and to be accounted as much ſuperior to all other religious feſtivals as the gods were to the heroes. Even the garments worn at the ſolemnity were ſuppoſed to partake of their efficacy, and to be endued with ſignal virtues. It was uſual to retain them until they were perishing; and then to dedicate them in the temple, or to reſerve them for the purpoſe of enwrapping new-born children.

The myſtic temple, as it was called, provided by Pericles for the ſolemnity, created ſuch awe by its ſanctity as could be equalled only by the effect of its beauty and magnitude, which excited aſtoniſhment in every beholder. The profane or uninitiated were forbidden to enter it on any pretence. Two young Acarnanians happened inadvertently to mix with the croud at the ſeaſon of the mysteries, and to go in; but the queſtion ſuggeſted by their ignorance preſently betrayed them, and their intrusion was puniſhed with death. The chief prieſt, hierophant, or myſtagogue, was taken from the Eumolpidæ, a holy family flouriſhing at Athens, and deſcended from Eumolpus, a ſhepherd and favourite of Ceres. He was enjoined celibacy, and wore a ſtole or long garment, his hair, and a wreath of myrtle. The grand requiſites in his character were ſtrength and melody of voice, ſolemnity of deportment, magnificence, and great decorum. Under him, beſides many of inferior ſtation, was the daduchus or torch-bearer, who had likewiſe his hair,

with a fillet; the prieſt, who officiated at the altar; and the hiero-ceryx or ſacred herald; all very important perſonages. The latter was of a family which claimed the god Mercury and Aglauros the daughter of Cecrops for its anceſtors.

The ſecrecy in which the mysteries were enveloped, ſerved to enhance the idea of their conſequence, and to increaſe the deſire of participation. It was ſo particular, that no perſon was allowed even to name the hierophant by whom he had been initiated. Public abhorrence and deteſtation awaited the babbler, and the law directed he ſhould die.

The Athenians ſuffered none to be initiated into theſe mysteries but ſuch as were members of their city. This regulation, which compelled Hercules, Caſtor, and Pollux, to become citizens of Athens, was ſtrictly obſerved in the firſt ages of the institution, but afterwards all perſons, barbarians excepted, were freely initiated.

The feſtivals were divided into great and leſs mysteries. The leſs were inſtituted from the following circumſtance. Hercules paſſed near Eleufis while the Athenians were celebrating the mysteries, and deſired to be initiated. As this could not be done, becauſe he was a ſtranger, and as Eumolpus was unwilling to diſpleaſe him on account of his great power, and the ſervices which he had done to the Athenians, another feſtival was inſtituted without violating the laws. It was called *μικρα*, and Hercules was ſolemnly admitted to the celebration and initiated. Theſe leſs mysteries were obſerved at Agræ near the Iliffus. The greater were celebrated at Eleufis, from which place Ceres has been called *Eleufinia*. In later times the ſmaller feſtivals were preparatory to the greater, and no perſon could be initiated at Eleufis without a previous purification at Agræ. This purification they performed by keeping themſelves pure, chaſte, and unpolluted, during nine days; after which they came and offered ſacrifices and prayers, wearing garlands of flowers, called *ισμερα* or *ιμπερα*, and having under their feet *Διός καδίων*, *Jupiter's ſkin*, which was the ſkin of a victim offered to that god. The perſon who aſſiſted was called *υδρανός* from *υδωρ* *water*, which was uſed at the purification, and they themſelves were called *μυσται*, *the initiated*.

A year after the initiation at the leſs mysteries they ſacrificed a ſow to Ceres, and were admitted in the greater, and the ſecrets of the feſtivals were ſolemnly revealed to them, from which they were called *εφοροι* and *εκοπται*, *inſpectors*.

This feſtival was obſerved in the month Boedromion or September, and continued nine days from the 15th till the 23d. During that time it was unlawful to arreſt any man or preſent any petition, on pain of forfeiting a thouſand drachmas, or according to others on pain of death. It was alſo unlawful for thoſe who were initiated to ſit upon the cover of a well, to eat beans, mullets, or weazels. If any woman rode to Eleufis in a chariot, ſhe was obliged by an edict of Lycurgus to pay 6,000 drachmas. The deſign of this law was to deſtroy all diſtinction between the richer and poorer ſort of citizens. When the ſeaſon approached, the myſtæ or perſons who had been initiated only in the leſſer mysteries, repaired to Eleufis to be inſtructed in the ceremonial. The ſervice for the opening of the temple, with morning ſacrifice, was performed.

Eleusinia.

formed. The ritual was then produced from the sanctuary. It was enveloped in symbolical figures of animals, which suggested words compendiously, in letters with ligatures, implicated, the tops huddled together, or disposed circularly like a wheel; the whole utterly inexplicable to the profane. The case, which was called *Petroma*, consisted of two stones exactly fitted. The mysterious record was replaced after the reading, and closed up until a future festival. The principal rite was nocturnal, and confined to the temple and its environs. The mystæ waited without, with impatience and apprehension. Lamentations and strange noises were heard. It thundered. Flashes of light and of fire rendered the deep succeeding darkness more terrible. They were beaten, and perceived not the hand. They beheld frightful apparitions, monsters, and phantoms of a canine form. They were filled with terror, became perplexed and unable to stir. The scene then suddenly changed to brilliant and agreeable. The propylæa or vestibules of the temple were opened, the curtains withdrawn, the hidden things displayed. They were introduced by the hierophant and daduchus, and the former showed them the mysteries. The splendor of illumination, the glory of the temple and of the images, the singing and dancing which accompanied the exhibition, all contributed to sooth the mind after its late agitation, and to render the wondering devotee tranquil and self-satisfied. After this inspection, or, as it was called, the *autopsia*, they retired, and others advanced. The succeeding days were employed in purification, in sacrifice, in pompous processions, and spectacles, at which they assisted, wearing myrtle-crowns. The second day was called *αλαδε μυσται*, *to the sea, you that are initiated*; because they were commanded to purify themselves by bathing in the sea. On the third day sacrifices, and chiefly a mullet, were offered; as also barley from a field of Eleusis. These oblations were called *θυσια*, and held so sacred that the priests themselves were not, as in other sacrifices, permitted to partake of them. On the fourth day they made a solemn procession, in which the *καλαθιον*, *holy basket of Ceres* was carried about in a consecrated cart, while on every side the people shouted *χαίρε Δημητρί*, *Hail, Ceres!* After these followed women, called *κισσοφοροι*, who carried baskets, in which was sesame, carded wool, grains of salt, a serpent, pomegranates, reeds, ivy boughs, certain cakes, &c. The fifth was called *ἡ τῶν λαμπάδων ἡμέρα*, *the torch day*; because on the following night the people ran about with torches in their hands. It was usual to dedicate torches to Ceres, and contend which should offer the biggest, in commemoration of the travels of the goddess, and of her lighting a torch in the flames of mount *Ætna*. The sixth day was called *Ιακχος*, from Iacchus, the son of Jupiter and Ceres, who accompanied his mother in her search after Proserpine with a torch in his hand. From that circumstance his statue had a torch in his hand, and was carried in solemn procession from the *Geramicus* to Eleusis. The statue with those that accompanied it, called *Ιακχαγωγοι*, was crowned with myrtle. In the way nothing was heard but singing and the noise of brazen kettles as the votaries danced along. The way through which they issued from the city was called *Ιερα οδός*, *the sacred way*, the resting place *Ιερα σπηλη*, from a *fig-tree* which grew in

the neighbourhood. They also stopped on a bridge over the *Cephissus*, where they derided those that passed by. After they had passed this bridge, they entered Eleusis by a place called *μυστικὴ ἰσθμὸς*, *the mystical entrance*. On the seventh day were sports, in which the victors were rewarded with a measure of barley, as that grain had been first sown in Eleusis. The eighth day was called *Ἐπιδαυρίων ἡμέρα*, because once *Æsculapius* at his return from *Epidaurus* to Athens was initiated by the repetition of the less mysteries. It became customary, therefore, to celebrate them a second time upon this, that such as had not hitherto been initiated might be lawfully admitted. The ninth and last day of the festival was called *πληροχοαι*, *earthen vessels*, because it was usual to fill two such vessels with wine; one of which being placed towards the east, and the other towards the west; which, after the repetition of some mystical words, were both thrown down, and the wine being spilt on the ground was offered as a libation.

The story of Ceres and Proserpine, the foundation of the Eleusinian mysteries, was partly local. It was both verbally delivered, and represented in allegorical show. Proserpine was gathering flowers when she was stolen by Pluto. Hence the procession of the holy basket, which was placed on a car dragged along by oxen, and followed by a train of females, some carrying the mystic chests, shouting, *Hail, Ceres!* At night a procession was made with lighted torches, to commemorate the goddess searching for her daughter. A measure of barley, the grain which, it was believed, she had given, was the reward of the victors in the gymnastic exercises; and the transaction at the temple had a reference to the legend. A knowledge of these things and places, from which the profane were excluded, was the amount of initiation; and the mode of it, which had been devised by craft, was skilfully adapted to the reigning superstitions. The operation was forcible, and the effect in proportion. The priesthood flourished as piety increased. The dispensation was corrupt, but its tendency not malignant. It produced sanctity of manners and an attention to the social duties; desire to be as distinguished by what was deemed virtue as by silence.

Some have supposed the principal rites at this festival to have been obscene and abominable, and that from thence proceeded all the mysterious secrecy. They were carried from Eleusis to Rome in the reign of Adrian, where they were observed with the same ceremonies as before, though perhaps with more freedom and licentiousness. They lasted about 1800 years, and were at last abolished by Theodosius the Great.

ELEUSIS, (anc. geog.) a town in Attica between Megara and the Piræus, celebrated for the festivals of Ceres. See the preceding article.—Those rites were finally extinguished in Greece upon the invasion of Alaric the Goth. Eleusis, on the overthrow of its goddess and the cessation of its gainful traffic, probably became soon an obscure place, without character or riches. For some ages, however, it was not entirely forsaken, as is evident from the vast consumption of the ancient materials, and from the present remains, of which the following account is given by Dr Chandler†.

“The port was small and of a circular form. The stones

Eleusinia.

Travels in
Greece,
p. 189.

Eleusinia. stones of one pier are seen above water, and the corresponding side may be traced. About half a mile from the shore is a long hill, which divides the plain. In the side next the sea are traces of a theatre, and on the top are cisterns cut in the rock. In the way to it, some masses of wall and rubbish, partly ancient, are standing; with ruined churches; and beyond, a long broken aqueduct crosses to the mountains. The Christian pirates had infested the place so much, that in 1676 it was abandoned. It is now a small village at the eastern extremity of the rocky brow, on which was once a castle; and is inhabited by a few Albanian families, employed in the culture of the plain, and superintended by a Turk, who resides in an old square tower. The proprietor was Achmet Aga, the primate or principal person of Athens.

"The mystic temple at Eleusis was planned by Ictinus, the architect of the Parthenon. Pericles was overseer of the building. It was of the Doric order; the cell so large as to admit the company of a theatre. The columns on the pavement within, and their capitals, were raised by Coræbus. Metagenes of Xypete added the architraves and the pillars above them, which sustained the roof. Another completed the edifice. This was a temple *in antis*, or without exterior columns, which would have occupied the room required for the victims. The aspect was changed to *Prostylos* under Demetrius the Phalerean; Philo a famous architect erecting a portico, which gave dignity to the fabric, and rendered the entrance more commodious. The site was beneath the brow, at the east end, and encompassed by the fortrefs. Some marbles, which are uncommonly massive, and some pieces of the columns, remain on the spot. The breadth of the cell is about 150 feet; the length, including the pronaos and portico, is 216 feet; the diameter of the columns, which are fluted 6 inches from the bottom of the shafts, is 6 feet and more than 6 inches. The temple was a decastyle or had 10 columns in the front, which was to the east. The peribolus or inclosure, which surrounded it on the north-east and on the south side, measures 387 feet in length from north to south, and 328 feet in breadth from east to west. On the west side it joined the angles of the west end of the temple in a straight line. Between the west wall of the inclosure and temple and the wall of the citadel was a passage of 42 feet 6 inches wide, which led to the summit of a high rock at the north-west angle of the inclosure, on which are visible the traces of a temple *in antis*, in length 74 feet 6 inches from north to south, and in breadth from the east to the wall of the citadel, to which it joined on the west, 54 feet. It was perhaps that sacred to Triptolemus. This spot commands a very extensive view of the plain and bay. About three-fourths of the cottages are within the precincts of the mystic temple, and the square tower stands on the ruined wall of the inclosure.

"At a small distance from the north end of the inclosure is a heap of marble, consisting of fragments of the Doric and Ionic orders; remains, it is likely, of the temples of Diana Propylea and of Neptune, and of the Propyleum or gateway. Wheler saw some large stones carved with wheat-ears and bundles of poppy. Near it is the bust of a colossal statue of excellent workmanship, maimed, and the face disfigured; the

breadth at the shoulders, as measured by Pococke, 5 feet and an half; and the basket on the head above 2 feet deep. It probably represented Proserpine. In the heap are two or three inscribed pedestals; and on one are a couple of torches, crossed. We saw another fixed in the stone stairs, which lead up the square tower on the outside. It belonged to the statue of a lady, who was hierophant or priestess of Proserpine, and had covered the altar of the goddess with silver. A well in the village was perhaps that called Callichorus, where the women of Eleusis were accustomed to dance in honour of Ceres. A tradition prevails, that if the broken statue be removed, the fertility of the land will cease. Achmet Aga was fully possessed with this superstition, and declined permitting us to dig or measure there, until I had overcome his scruples by a present of a handsome snuff-box containing several zechins or pieces of gold."

ELEUTHERIA, a festival celebrated at Plataea in honour of Jupiter *Eleutherius*, or "the assertor of liberty," by delegates from almost all the cities of Greece. Its institution originated in this: After the victory obtained by the Grecians under Pausanias over Mardonius the Persian general in the country of Plataea, an altar and statue were erected to Jupiter Eleutherius, who had freed the Greeks from the tyranny of the barbarians. It was further agreed upon in a general assembly, by the advice of Aristides the Athenian, that deputies should be sent every fifth year, from the different cities of Greece, to celebrate Eleutheria, festivals of liberty. The Plataeans celebrated also an anniversary festival in memory of those who had lost their lives in that famous battle. The celebration was thus: At break of day a procession was made with a trumpeter at the head, sounding a signal for battle. After him followed chariots loaded with myrrh, garlands, and a black bull, and certain free young men, as no signs of servility were to appear during the solemnity, because they in whose honour the festival was instituted had died in the defence of their country. They carried libations of wine and milk in large-eared vessels, with jars of oil, and precious ointments. Last of all appeared the chief magistrate, who, though not permitted at other times to touch iron, or wear garments of any colour but white, yet appeared clad in purple, and taking a water-pot out of the city chamber, proceeded through the middle of the town, with a sword in his hand, towards the sepulchres. There he drew water from a neighbouring spring, and washed and anointed the monuments, after which he sacrificed a bull upon a pile of wood, invoking Jupiter and infernal Mercury, and inviting to the entertainment the souls of those happy heroes who had perished in the defence of their country. After this he filled a bowl with wine, saying, I drink to those who lost their lives in the defence of the liberties of Greece. There was also a festival of the same name observed by the Samians in honour of the god of love. Slaves also, when they obtained their liberty, kept a holiday, which they called *Eleutheria*.

ELF, a term now almost obsolete, formerly used to denote a fairy or hobgoblin; an imaginary being, the creature of ignorance, superstition, and craft. See FAIRY.

Elf-Arrows, in natural history, a name given to the flints.

Elgin flints anciently fashioned into arrow-heads, and still found fossil in Scotland, America, and several other parts of the world: they are believed by the vulgar to be shot by fairies, and that cattle are sometimes killed by them.

ELGIN, the capital of the county of Moray in Scotland, and formerly a bishop's see, is situated on the river Lofey about six miles north from the Spey, in W. Long. 2: 25: N. Lat. 57. 40. Mr Pennant says, it is a good town, and has many of the houses built over piazzas; but, excepting its great cattle-fairs, has little trade. It is principally remarkable for its ecclesiastical antiquities. The cathedral, now in ruins, has been formerly a very magnificent pile. The west door is very elegant and richly ornamented. The choir is very beautiful, and has a fine and light gallery running round it; and at the east end are two rows of narrow windows in an excellent Gothic taste. The chapter-house is an octagon; the roof supported by a fine single column with neat carvings of coats of arms round the capital. There is still a great tower on each side of this cathedral; but that in the centre, with the spire and whole roof, are fallen in; and form most awful fragments, mixed with the battered monuments of knights and prelates. Boethius says, that Duncan, who was killed by Macbeth at Inverness, lies buried here. The place is also crowded with a number of modern tomb-stones.—The cathedral was founded by Andrew de Moray, in 1224, on a piece of land granted by Alexander II.; and his remains were deposited in the choir, under a tomb of blue marble, in 1244. The great tower was built principally by John Innes bishop of this see, as appears by the inscription cut on one of the great pillars: "Hic Jacet in Xto, pater et dominus, Dominus Johannes de Innes hujus ecclesie Episcopus;—qui hoc notabile opus incepit et per septennium ædificavit." Elgin is a royal borough; and gives title of earl to the family of Bruce.

ELIAS, the prophet, memorable for having escaped the common catastrophe of mankind; being taken up alive into heaven, in a fiery chariot, about 895 B. C. See the Bible.

ELICHMAN (John), a native of Silesia in the 17th century, who practised physic at Leyden, and was remarkable for understanding 16 languages. He supported an opinion, that the German and Persian languages were derived from the same origin. His Latin translation of the Tablet of Cebes, with the Arabic version and the Greek, was printed at Leyden in 1640, under the care of Salmasius, who prefixed thereto a very ample preface.

ELIQUATION, in chemistry, an operation by which a more fusible substance is separated from one that is less so, by means of a heat sufficiently intense to melt the former, but not the latter. Thus an alloy of copper and lead may be separated by a heat capable of melting the latter, but not the former.

ELIS. See ELEA.

ELIS, (anc. geog.), the capital of the district of that name in Peloponnesus, situated on the Peneus, which ran through it. It was the country of Phædo the philosopher, scholar of Socrates, and friend of Plato; who inscribes with his name the dialogue on the im-

mortality of the soul. Pyrrho also was of this city, at the head of the sect called after him *Pyrrhonists*.

The city of Elis owed its origin to an union of small towns after the Persian war. It was not encompassed immediately with a wall; for it had the care of the temple at Olympia, and its territory was solemnly consecrated to Jupiter. To invade or not protect it was deemed impiety; and armies, if marching through, delivered up their weapons, which, on their quitting it, were restored. Amid warring states the city enjoyed repose, was resorted to by strangers, and flourished. The region round about it was called *cale* or *hollow*, from the inequalities. The country was reckoned fertile, and particularly fit for the raising of flax. This, which grew nowhere else in Greece, equalled the produce of Judæa in fineness, but was not so yellow. Elis was a school, as it were, for Olympia, which was distant 37 miles. The athletic exercises were performed there, before the more solemn trial, in a gymnasium, by which the Peneus ran. The hellanodics or præfects of the games paired the rival combatants by lot, in an area called *Plethrum* or *The Acre*. Within the wall grew lofty plane-trees; and in the court, which was called the *Xystus*, were separate courses marked for the foot-races. A smaller court was called the *Quadrangle*. The præfects, when chosen, resided for 10 months in a building erected for their use, to be instructed in the duties of their office. They attended before sun-rise to preside at the races; and again at noon, the time appointed for the pentathlon or five sports. The horses were trained in the agora or market-place, which was called the *Hippodrome*. In the gymnasium were altars and a cenotaph of Achilles. The women, besides other rites, beat their bosoms in honour of this hero, on a fixed day toward sunset. There also was the town-hall, in which extemporary harangues were spoken and compositions recited. It was hung round with bucklers for ornaments. A way led from it to the baths through the Street of Silence; and another to the market-place, which was planned with streets between porticoes of the Doric order adorned with altars and images. Among the temples one had a circular peristyle or colonnade; but the image had been removed and the roof was fallen in the time of Pausanias. The theatre was ancient, as was also a temple of Bacchus, one of the deities principally adored at Elis. Minerva had a temple in the citadel, with an image of ivory and gold made (it was said) by Phidias. At the gate leading to Olympia was the monument of a person, who was buried, as an oracle had commanded, neither within nor without the city. The structures of Elis, Dr Chandler observes, seem to have been raised with materials far less elegant and durable than the produce of the Ionian and Attic quarries. The ruins are of brick, and not considerable, consisting of pieces of ordinary wall, and an octagon building with niches, which, it is supposed, was the temple with a circular peristyle. These stand detached from each other, ranging in a vale southward from the wide bed of the river Peneus; which, by the margin, has several large stones, perhaps reliques of the gymnasium. The citadel was on a hill, which has on the top some remnants of wall.

ELISHA the prophet, famous for the miracles he performed, died about 830 B. C. See the Bible.

ELISION,

Elis,
Elisba.

Elision
Elizabeth.

ELISION, in grammar, the cutting off or suppressing a vowel at the end of a word, for the sake of sound or measure, the next word beginning with a vowel.

Elisions are pretty frequently met with in English poetry, but more frequently in the Latin, French, &c. They chiefly consist in suppressions of the *a*, *e*, and *i*, though an elision suppresses any of the other vowels.

ELIXATION, in pharmacy, the extracting the virtues of ingredients by boiling or stewing.

ELIXIR, in medicine, a compound tincture extracted from many efficacious ingredients. Hence the difference between a tincture and an elixir seems to be this, that a tincture is drawn from one ingredient, sometimes with an addition of another to open it and to dispose it to yield to the menstruum; whereas an elixir is a tincture extracted from several ingredients at the same time.

ELIZABETH, queen of England, daughter of Henry VIII. and Anna Boleyn, was born at Greenwich, September 7th, 1533. According to the humour of the times, she was early instructed in the learned languages, first by Grindal, who died when she was about 17, and afterwards by the celebrated Roger Ascham. She acquired likewise considerable knowledge of the Italian, Spanish, and French languages. Dr Grindal was also her preceptor in divinity, which she is said to have studied with uncommon application and industry. That Elizabeth became a Protestant, and her sister Mary a Papist, was the effect of that cause which determines the religion of all mankind; namely, the opinion of those by whom they were educated: and this difference of opinion, in their tutors, is not at all surprising, when we recollect, that their father Harry was of both religions, or of neither.

But the studies of Elizabeth were not confined merely to languages and theology: she was also instructed in the political history of the ancients; and was so well skilled in music, as to sing and play "artfully and sweetly."

After the short reign of her brother Edward, our heroine being then about 20 years of age, her *firebrand* sister acceding to the crown, Elizabeth experienced a considerable degree of persecution, so as to be not a little apprehensive of a violent death. She was accused of nobody knows what; imprisoned; and, we are told, inhumanly treated. At last, by the intercession of king Philip of Spain, she was set at liberty; which she continued to enjoy till, on the death of her *pious* sister, she, on the 17th of November 1558, ascended the throne of England. Her political history as a queen, is universally known and admired*: but her attention to the government of her kingdom did not totally suspend her pursuit of learning. Ascham, in his *Schoolmaster*, tells us, that, about the year 1563, five years after her accession, she being then at Windsor, besides her perfect readiness in Latin, Italian, French, and Spanish, she read more Greek in one day than some prebendaries of that church did read Latin in a whole week, (p. 21.)—She employed Sir John Fortescue to read to her, Thucydides, Xenophon, Polybius, Euripides, Æschines, and Sophocles. (*Ballard*, p. 219.)—That the Latin language was familiar to her, is evident from her speech to the university of Oxford,

* See (History of) England.

when she was near sixty; also from her spirited answer to the Polish ambassador in the year 1598. And that she was also skilled in the art of poetry appears, not only from the several scraps which have been preserved, but likewise from the testimony of a cotemporary writer, Puttenham, in his *Art of Engl. Poetry* (a very scarce book). These are his words:—"But, last in recital, and first in degree, is the queen, whose learned, delicate, noble muse, easily surmounteth all the rest, for sense, sweetness, or subtilty, be it in ode, elegy, epigram, or any other kind of poem," &c. In this author are to be found only a specimen of 16 verses of her English poetry. "But," says Mr Walpole, "a greater instance of her genius, and that too in Latin, was her extempore reply to an insolent prohibition delivered to her from Philip II. by his ambassador, in this tetraëtic.

Te veto ne pergas bello defendere Belgas:
Quæ Dracus eripuit, nunc restituantur oportet:
Quas pater evertit, jubeo te condere cellas:
Religio papæ fac restituatur ad unguem.

"She instantly answered him, with as much spirit as she used to return his invasions,"

Ad Græcas, bone rex, sient mandata kalendas.

Being earnestly pressed by a Romish priest, during his persecution, to declare her opinion concerning the real presence of Christ's body in the wafer, she answered,

Christ was the word that spake it;
He took the bread, and brake it;
And what that word did make it,
That I believe, and take it.

Fuller's Holy State.

She gave the characters of four knights of Nottinghamshire in the following distich:

Gervase the gentle, Stanhope the stout,
Markham the lion, and Sutton the lout.

Walp. Cat.

Coming into a grammar-school, she characterised three classic authors in this hexameter:

Perfius a crab-staff; bawdy Martial; Ovid a fine wag.
Full. Worth. of Warw. 126.

Sir Walter Raleigh having wrote on a window,

Fain would I climb, yet fear I to fall;
She immediately wrote under it,

If thy heart fail thee, climb not at all.

Worth. of Devonsh. 261.

Doubtless, she was a woman of singular capacity and extraordinary acquirements: and, if we could forget the story of the Scottish Mary, and of her favourite Essex, together with the burning of a few Anabaptists; in short, could we forbear to contemplate her character through the medium of religion and morality, we might pronounce her the most illustrious of illustrious women. See further, the articles ENGLAND, MARY, and SCOTLAND. She died in her palace at Richmond, the 24th of March 1602, aged 70, having reigned 44 years; and was interred in the chapel of Henry VII. in Westminster Abbey. Her successor James erected a magnificent monument to her memory.—She wrote, 1. The Mirrour, or Glasse of the Sinful Soul. This was translated out of French verse into English

Elizabeth
Ell.

English prose, when she was eleven years old. It was dedicated to queen Catharine Parr. Probably it was never printed; but the dedication and preface are preserved in the *Sylloge epistolarum*, in Hearne's edition of *Livii Foro-Julienfis*, p. 161. 2. Prayers and Meditations, &c. Dedicated to her father, dated at Hatfield, 1545. Manuscript, in the royal library. 3. A Dialogue out of Xenophon, in Greek, between Hiero a King, yet some time a private person, and Simonides a Poet, as touching the life of the Prince and Private Man. First printed, from a manuscript in her majesty's own hand-writing, in the Gentleman's Magazine for 1743. 4. Two Orationes of Isocrates, translated into Latin. 5. Latin Oration at Cambridge. Preserved in the king's library: also in Hollinshed's Chron. p. 1206; and in Fuller's Hist. of Cambr. p. 138. 6. Latin Oration at Oxford. See Wood's Hist. and Antiq. of Oxf. lib. i. p. 289. also in Dr Jebb's Append. to his Life of Mary Queen of Scots. 7. A Comment on Plato. 8. *Boethius de consolatione philosophiæ*, translated into English anno 1593. 9. *Sallust de bello Jugurthino*, translated into English anno 1590. 10. A play of Euripides, translated into Latin, (Cat. of Royal Auth.) 11. A Prayer for the use of her fleet in the great expedition in 1596. 12. Part of Horace's Art of Poetry, translated into English anno 1598. 13. *Plutarch de curiositate*, translated into English. 14. Letters on various occasions to different persons: several speeches to her parliament; and a number of other pieces.

ELIZABETH PETROWNA, (daughter of Peter the Great), the last empress of Russia, distinguished herself by her signal clemency. She made a vow, that no person should be put to death in her reign, and she strictly observed it. The example has been followed, and confirmed by law, under the present august sovereign of Russia, Catharine II. Elizabeth died in 1762, in the 21st year of her reign and 52d of her age.

ELK, in zoology. See CERVUS.

ELL, (*ulna*), a measure, which obtains, under different denominations, in most countries, whereby cloths, stuffs, linens, silks, &c. are usually measured; answering nearly to the yard of England, the canna of Italy, the vara of Spain, the palm of Sicily, &c.

Servius will have the ell to be the space contained between the two hands when stretched forth; but Suetonius makes it only the cubit.

The ells most frequently used with us are the English and Flemish; the former containing three feet nine inches, or one yard and a quarter; the latter only 27 inches, or three quarters of a yard; so that the ell English is to the Flemish ell as five to three. In Scotland, the ell contains $37\frac{2}{5}$ English inches.

M. Ricard, in his Treatise of Commerce, reduces the

ells thus: 100 ells of Amsterdam are equal to $98\frac{1}{2}$ of Brabant, Antwerp, and Brussels; to $58\frac{1}{2}$ of England and France; to 120 of Hamburg, Francfort, Leipzig, and Cologne; 125 of Breslaw; 110 of Bergen and Drontheim; and 117 of Stockholm.

ELLIOT, (the Right Honourable George Augustus, Lord Heathfield), was the youngest son of the late Sir Gilbert Elliot, Baronet, of Stobbs (A) in Roxburghshire; and was born about the year 1718. He received the first rudiments of his education under a private tutor; and at an early time of life was sent to the university of Leyden, where he made considerable progress in classical learning, and spoke with fluency and elegance the German and French languages. Being designed for a military life, he was sent from thence to the celebrated *Ecole Royale du Genie Militaire*, conducted by the great Vauban, at La Fere in Picardy; where he laid the foundation of what he so conspicuously exhibited at the defence of Gibraltar. He completed his military course on the continent by a tour, for the purpose of seeing in practice what he had studied in theory. Prussia was the model for discipline, and he continued some time as a volunteer in that service.

Mr Elliot returned in the 17th year of his age to his native country, Scotland; and was the same year, 1735, introduced by his father Sir Gilbert to Lieutenant-Colonel Peers of the 23d regiment of foot, then lying at Edinburgh, as a youth anxious to bear arms for his king and country. He was accordingly entered as a volunteer in that regiment, where he continued for a year or more. From the 23d regiment he went into the engineer corps at Woolwich, and made great progress in that study, until his uncle Colonel Elliot brought him in his adjutant of the second troop of horse grenadiers. With these troops he went upon service to Germany, and was with them in a variety of actions. At the battle of Dettingen he was wounded. In this regiment he bought the rank of captain and major, and afterwards purchased the lieutenant-colonelcy from Colonel Brewerton, who succeeded to his uncle. On arriving at this rank, he resigned his commission as an engineer, which he had enjoyed along with his other rank, and in which service he had been actively employed very much to the advantage of his country. He received the instructions of the famous engineer Bellidor, and made himself completely master of the science of gunnery. Had he not so disinterestedly resigned his rank in the engineer department, he would long before his death, by regular progression, have been at the head of that corps. Soon after this he was appointed aid-de-camp to George II. and was distinguished for his military skill and discipline. In the year 1759, he quitted the second troop of horse grenadier guards, being selected to raise, form, and discipline,

Elliot.

(A) The ancient and honourable family of Elliot of Stobbs, as well as the collateral branch of Elliot of Minto in the same county, and of Elliot of Port-Elliot in Cornwall, are originally from Normandy. Their ancestor, Mr Aliott, came over with William the Conqueror, and held a distinguished rank in his army. There is a traditionary anecdote in the family relating to an honourable distinction in their coat, which, as it corresponds with history, bears the probability of truth. When William set foot on English land, he slipped and fell on the earth. He sprung up, and exclaimed that it was a happy omen—he had embraced the country of which he was to become the lord. Upon this Aliott drew his sword, and swore by the honour of a soldier, that he would maintain, at the hazard of his blood, the right of his lord to the sovereignty of the earth which he had embraced. On the event of conquest, King William added to the arms of Aliott, which was a baton or, on a field azure, an arm and sword as a crest, with the motto, *Per saxa, per ignes, fortiter et recte*.

Elliot.

discipline, the first regiment of light horse, called after him *Elliot's*. As soon as they were raised and formed, he was appointed to the command of the cavalry in the expedition on the coasts of France, with the rank of brigadier general. After this he passed into Germany, where he was employed on the staff, and greatly distinguished himself in a variety of movements; where his regiment displayed a strictness of discipline, an activity and enterprise, which gained them signal honour: and indeed they have been the pattern regiment, both in regard to discipline and appointment, to the many light dragoon troops that have been since raised in our service. From Germany he was recalled for the purpose of being employed as second in command in the memorable expedition against the Havannah; the circumstances of which conquest are well known.

On the peace his gallant regiment was reviewed by the king, when they presented to his majesty the standards which they had taken from the enemy. Gratified with their fine discipline and high character, the king asked General Elliot what mark of his favour he could bestow on his regiment equal to their merit? He answered, that his regiment would be proud if his majesty should think, that, by their services, they were intitled to the distinction of *Royals*. It was accordingly made a royal regiment, with this flattering title, "The 15th, or King's Royal Regiment of Light Dragoons." At the same time the king expressed a desire to confer some honour on the general himself; but the latter declared, that the honour and satisfaction of his Majesty's approbation of his services was his best reward.

During the peace he was not idle. His great talents in the various branches of the military art gave him ample employment. In the year 1775, he was appointed to succeed General A'Court as commander in chief of the forces in Ireland; but did not continue long in this station, not even long enough to unpack all his trunks: for finding that interferences were made by petty authority derogatory of his own, he resisted the practice with becoming spirit; and not choosing to disturb the government of the sister kingdom on a matter personal to himself, he solicited to be recalled. He accordingly was so, and appointed to the command of Gibraltar in a fortunate hour for the safety of that important fortress. The system of his life, as well as his education, peculiarly qualified him for this trust. He was perhaps the most abstemious man of the age; neither indulging himself in animal food nor wine. He never slept more than four hours at a time; so that he was up later and earlier than most other men. He so injured himself to habits of hardiness, that the things which are difficult and painful to other men, were to him his daily practice, and rendered pleasant by use. It could not be easy to starve such a man into a surrender, nor possible to surprise him. The example of the commander in chief in a besieged garrison had a most persuasive efficacy in forming the manners of the soldiery. Like him his brave followers came to regulate their lives by the most strict rules of discipline before there arose a necessity for so doing; and severe exercise, with short diet, became habitual to them by their own choice. The military system of discipline which he introduced, and the preparations which he made for his defence, were contrived with so much judgment,

and executed with so much address, that he was able with a handful of men to preserve his post against an attack, the constancy of which, even without the vigour, had been sufficient to exhaust any common set of men. Collected within himself, he in no instance destroyed, by premature attacks, the labours which would cost the enemy time, patience, and expence to complete; he deliberately observed their approaches, and seized on the proper moment, with the keenest perfection, in which to make his attack with success. He never spent his ammunition in useless parade or in unimportant attacks. He never relaxed from his discipline by the appearance of security, nor hazarded the lives of his garrison by wild experiments. By a cool and temperate demeanour, he maintained his station for three years of constant investment, in which all the powers of Spain were employed. All the eyes of Europe were on this garrison; and his conduct has justly exalted him to the most elevated rank in the military annals of the day. On his return to England, the gratitude of the British senate was as forward as the public voice in giving him that distinguished mark his merit deserved. Both houses of parliament voted an unanimous address of thanks to the general. The king conferred on him the honour of Knight of the Bath, with a pension during his own and a second life of his own appointment; and on June 14. 1787, his majesty advanced him to the peerage by the title of *Lord Heathfield Baron Gibraltar*, permitting him to take, in addition to his family arms, the arms of the fortress he had so bravely defended, to perpetuate to futurity his noble conduct.

His lordship died on the 6th of July 1790, at his chateau at Aix-la-Chapelle, of a second stroke of the palsy, after having for some weeks preceding enjoyed tolerable good health and an unusual flow of spirits. His death happened two days before he was to have set out for Leghorn in his way to Gibraltar; of which place he was once more appointed to the defence, in the view of an approaching war.—He married Anne, daughter of Sir Francis Drake of Devonshire; and had by her (who died in 1769) Francis-Augustus, now Lord Heathfield, lieutenant-colonel of the 6th regiment of horse.

ELLIPOMACROSTYLA, in natural history, the name of a genus of crystals. The word is derived from the Greek, *ελλιπης imperfect*, *μακρος long*, and *στυλος a column*; and expresses an imperfect crystal with a long column. The perfect figure of crystal being a column terminated by a pyramid at each end, those which want this character are esteemed imperfect: and accordingly the bodies of this genus are defined to be imperfect crystals with single pyramids; one end of their column being affixed to some solid body, and composed of thin and slender hexangular columns, terminated by hexangular pyramids.

ELLIPOPACHYSTYLA, in natural history, the name of a genus of crystals. The word is derived from the Greek, *ελλιπης imperfect*, *παχυσ thick*, and *στυλος a column*, and expresses a crystal of the imperfect kind with a thick column. The bodies of this genus are crystals composed of an hexangular column, considerably thick and short, affixed irregularly at one end to some solid body, and terminated at the other by an hexangular pyramid.

Elliot
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Ellipopa-
chystyla.

Ellipsis

Elogy.

ELLIPSIS, in geometry, a curve line returning into itself, and produced from the section of a cone by a plane cutting both its sides, but not parallel to the base. See *CONIC SECTIONS*.

ELLIPSIS, in grammar, a figure of syntax, where in one or more words are not expressed; and from this deficiency it has got the name *ellipsis*.

ELLIPTIC, or **ELLIPTICAL**, something belonging to an *ellipsis*.

ELLIPOMACHROSTYLA, in natural history, a genus of imperfect crystals, with single pyramids; one end of their column being affixed to some solid body. They are dodecahedral, with hexangular columns and hexangular pyramids.

Of these crystals authors enumerate a great many species; among which are the whitish pellucid sprig crystal, a bright brown kind, a dull brown kind, and a bright yellow kind; all which are farther distinguished according to the different lengths of their pyramids.

ELLIPOPACRYSTYLA, in natural history a genus of imperfect crystals, composed of 12 planes, in an hexangular column, terminated by an hexangular pyramid at one end, and irregularly affixed to some other body at the other, with shorter columns.

There are two species of these crystals; one short, bright, and colourless, found in great plenty in New Spain and other parts of America; the other, a short, dull, and dusky brown one, found in Germany, and sometimes in England.

ELLISIA, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 28th order, *Luride*. The corolla is monopetalous and funnel-shaped; the berry carnosous and bilocular; there are two seeds muricated or set with small raised points, the one higher than the other.

ELM, in botany. See **ULMUS**.

ELMACINUS (George), author of a *History of the Saracens*, was born in Egypt towards the middle of the 13th century. His history comes down from Mahomet to the year of the Hegira 512, answering to the year of our Lord 1134; in which he sets down year by year, in a very concise manner, whatever regards the Saracen empire, intermixed with some passages relating to the eastern Christians. His abilities must have been considerable; since, though he professed Christianity, he held an office of trust near the persons of the Mahometan princes. He was son to Yaser Al Amid, secretary to the council of war under the sultans of Egypt for 45 years; and in 1238, when his father died, succeeded him in his place. His history of the Saracens was translated from Arabic into Latin by Erpinus; and printed in these two languages in folio, at Leyden, in 1625. Erpinus died before the publication; but Golius took care of it, and added a preface. It was dedicated by Erpinus's widow to Dr Andrews, bishop of Winchester.

ELOCUTION. See **ORATORY**, Part III.

ELOGY, a praise or panegyric bestowed on any person or thing, in consideration of its merit. The beauty of elogy consists in an expressive brevity. Eulogiums should not have so much as one epithet, properly so called, nor two words synonymous: they

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should strictly adhere to truth; for extravagant and improbable elogies rather lessen the character of the person or thing they would extol.

ELOHI, **ELOI**, or *Elohim*, in scripture, one of the names of God. But it is to be observed, that angels, princes, great men, judges, and even false gods, are sometimes called by this name. The sequel of the discourse is what assists us in judging rightly concerning the true meaning of this word. It is the same as *Eloha*. One is the singular, the other the plural. Nevertheless *Elohim* is often constructed in the singular number, particularly when the true God is spoken of; but when false gods are spoke of, it is construed rather in the plural.

ELOINED, in law, signifies restrained or hindered from doing something: thus it is said, that if those within age be eloined, so that they cannot sue personally, their next friend shall sue for them.

ELONGATION, in astronomy, the digression or recess of a planet from the sun, with respect to an eye placed on our earth. The term is chiefly used in speaking of Venus and Mercury, the arch of a great circle intercepted between either of these planets and the sun being called the *elongation* of that planet from the sun.

ELONGATION, in surgery, is an imperfect luxation, occasioned by the stretching or lengthening of the ligaments of any part.

ELOPEMENT, in law, is where a married woman departs from her husband, and cohabits with an adulterer; in which case the husband is not obliged to allow her any alimony out of his estate, nor is he chargeable for necessaries for her of any kind. However, the bare advertising a wife in the gazette, or other public paper, is not a legal notice to persons in general not to trust her; though a personal notice given by the husband to particular persons is said to be good.—An action lies, and large damages may be recovered, against a person for carrying away and detaining another man's wife.

ELOQUENCE, the art of speaking well, so as to affect and persuade. See **ORATORY**.

ELSHEIMER (Adam), a celebrated painter, born at Francfort on the Maine, 1574. He was first a disciple of Philip Uffenbach a German; but his desire of improvement carrying him to Rome, he soon became a most excellent artist in landscapes, history, and night-pieces, with small figures. His works are but few; and the great pains he bestowed in finishing them raised their prices so high, that they are hardly any where to be found but in the cabinets of princes. He was of a melancholy turn, and sunk under the embarrassments of his circumstances in 1610. James Ernest Thomas of Landau was his disciple; and imitated his style so nicely, that their performances are not easily distinguished.

ELSIMBURG, a port-town of Sweden, in the province of Gothland, and territory of Schonen, seated on the side of the Sound, over against Elsinore. It was formerly a fortress belonging to the Danes; but all the fortifications were demolished in 1679, and there is only one tower of a castle which remains undemolished. It now belongs to Sweden. E. Long. 13. 20. N. Lat. 56. 2.

4 B

ELSI-

Elohi
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Elsimburg.

Elfinore,
Elvas.

ELSINORE, or **ELSINÖR**, a port-town of Denmark, seated on the Sound, in the isle of Zealand. E. Long. 13. 23. N. Lat. 56. 0. — It was a small village, containing a few fishermen's huts, until 1445, when it was made a staple town by Eric of Pomerania; who conferred upon the new settlers considerable immunities, and built a castle for their defence. From that period it gradually increased in size and wealth, and is now the most commercial place in Denmark next to Copenhagen. It contains about 5000 inhabitants, amongst whom are a considerable number of foreign merchants, and the consuls of the principal nations trading to the Baltic. The passage of the Sound is guarded by the fortress of Cronborg, which is situated upon the edge of a peninsular promontory, the nearest point of land from the opposite coast of Sweden. It is strongly fortified towards the shore by ditches, bastions, and regular entrenchments; and towards the sea by several batteries, mounted with 60 cannon, the largest whereof are 48 pounders. Every vessel, as it passes, lowers her top-sails, and pays a toll at Elsinore. It is generally asserted, that this fortress guards the Sound; and that all the ships must, on account of the shoal waters and currents, steer so near the batteries as to be exposed to their fire in case of refusal. This, however, is a mistaken notion. On account indeed of the numerous and opposite currents in the Sound, the safest passage lies near the fortresses; but the water in any part is of sufficient depth for vessels to keep at a distance from the batteries, and the largest ships can even sail close to the coast of Sweden. The constant discharge, however, of the toll, is not so much owing to the strength of the fortress as to a compliance with the public law of Europe. Many disputes have arisen concerning the right by which the crown of Denmark imposes such a duty. The kings of Sweden, in particular, claiming an equal title to the free passage of the Strait, were for some time exempted by treaty from paying it; but in 1720, Frederic I. agreed that all Swedish vessels should for the future be subject to the usual imposts. All vessels, beside a small duty, are rated at $1\frac{1}{4}$ per cent. of their cargoes, except the English, French, Dutch, and Swedish, which pay only one per cent. and in return, the crown takes the charge of constructing light-houses, and erecting signals to mark the shoals and rocks, from the Categate to the entrance into the Baltic. The tolls of the Sound, and of the two Belts, supply an annual revenue of above L. 100,000.

ELVAS, a large town, and one of the best and most important in Portugal, seated in the province of Alentejo, a few miles from the frontiers of Estramadura in Spain. It is built on a mountain, and is strongly fortified with works of free-stone. The streets of the town are handsome, and the houses neat; and there is a cistern so large, that it will hold water enough to supply the whole town six months. The water is conveyed to it by a magnificent aqueduct, three miles in length, sustained in some places by four or five high arches, one upon another. It was bombarded by the French and Spaniards in 1706, but without effect. It has generally a garrison of 1000 men. The king founded an academy here, in 1733, for young gentlemen. W. Long. 7. 28. N. Lat. 38. 39.

ELUDING, the act of evading or rendering a thing vain and of no effect; a dexterous getting clear, or escaping out of an affair, difficulty, embarrassment, or the like. We say, to *elude* a proposition, &c. The design of chicanery is, to *elude* the force of the laws: this doctor has not resolved the difficulty, but *eluded* it. Alexander, says the historian, in cutting the Gordian knot, either *eluded* the oracle or fulfilled it: *Ille nequicquam luctatus cum latentibus nodis, Nihil, inquit, interest, quomodo solvatur; gladioque ruptis omnibus loris, oraculi sortem vel eludit, vel implevit.*

ELVELA, in botany: A genus of the natural order of fungi, belonging to the cryptogamia class of plants. The fungus is turbinated, or like an inverted cone.

ELUL, in ancient chronology, the 12th month of the Jewish civil year, and the sixth of the ecclesiastical: it consisted of only 29 days, and answered pretty nearly to our August.

ELUTRIATION, in chemistry, an operation performed by washing solid substances with water, stirring them well together, and hastily pouring off the liquid, while the lighter part remains suspended in it, that it may thereby be separated from the heavier part. By this operation metallic ores are separated from earth, stones, and other unmetallic particles adhering to them.

ELY, a city and bishop's see of Cambridgeshire, situated about 12 miles north of Cambridge. E. Long. 15. 0. N. Lat. 52. 24. It is a county of itself, including the territory around; and has a judge who determines all causes civil and criminal within its limits. The church hath undergone various alterations since it was first established by Etheldra, the wife of Egfride, king of Northumberland, who founded a religious house here, and planted it with virgins, and became the first abbess of it herself. The Danes entirely ruined this establishment; then Ethelwald, the 27th bishop of Winchester, rebuilt the monastery, and filled it with monks; to whom king Edgar, and many succeeding monarchs, bestowed many privileges, and great grants of land; so that this abbey became in process of time the best of any in England. Richard, the 11th abbot, wishing to free himself of the bishop of Lincoln, within whose diocese his monastery was situated, and not liking so powerful a superior, he made great interest with king Henry I. to get Ely erected into a bishoprick; and spared neither purse nor prayers to bring this about. He even brought the bishop of Lincoln to consent to it, by giving him and his successors the manors of Bugden, Biggleswade, and Spalding, which belonged to the abbey, in lieu of his jurisdiction; but he lived not to taste the sweets of his industry and ambition, he dying before his abbey was erected into a see. His successor was the first bishop of Ely: but the great privileges the bishop enjoyed were almost wholly taken away, or much restricted, by the act of parliament, 27th Henry VIII. regarding the restoring to the crown the ancient royalties: So, instead of being palatine of the isle of Ely, the bishop and his temporal steward were by that act declared to be from thenceforth justices of the peace in the said island. This diocese contains all Cambridgeshire, and the isle of Ely, excepting Iselham, which belongs to the see of Rochester, and 15 other parishes, that are in the diocese of Norwich; but it has a parish in Norfolk,

Elymais folk, viz. Emneth. The number of parishes in this diocese are 141, whereof 75 are impropriate. It hath but one archdeacon, viz. of Ely. It is valued in the king's books at L.2134:18:5. The clergy's tenth, amounting to the sum of L.384:14:9½. The bishopric is computed to be worth annually L.4000. The church is dedicated to St Ethelred. The building, as it now appears, has been the work of several of its bishops. The west parts were rebuilt by bishop Ridal; the choir and lantern were begun by bishop Norwold, and finished by bishop Frodsham. This see hath given two saints and two cardinals to the church of Rome; and to the English nation nine lord chancellors, seven lord treasurers, one lord privy-seal, one chancellor of the exchequer, one chancellor to the university of Oxford, two masters of the rolls, and three almoners. To this cathedral belong a bishop, a dean, an archdeacon, eight prebendaries, with vicars, lay-clerks, choristers, a schoolmaster, usher, and 28 king's scholars.

ELYMAIS, the capital city of the land of Elam, or the ancient Persia. We are told (1 Mac. vi. 1.) that Antiochus Epiphanes, having understood that there were very great treasures lodged in a temple at Elymais, determined to go and plunder it: but the citizens getting intelligence of his design, made an insurrection, forced him out of the city, and obliged him to fly. The author of the second book of Maccabees (ix. 2.) calls this city *Persepolis*, in all probability because formerly it was the capital of Persia: for it is known from other accounts, that *Persepolis* and *Elymais* were two very different cities, the latter situated upon the *Eulæus*, the former upon the *Araxis*.

ELYMUS, in botany: A genus of the *digyia* order, belonging to the *triandria* class of plants; and in the natural method ranking under the fourth order, *Gramina*. The calyx is lateral, bivalved, aggregate, and multiflorous.

ELYOT (Sir Thomas), a gentleman of eminent learning in the 16th century, was educated at Oxford, travelled into foreign countries, and upon his return was introduced to court. His learning recommended him to Henry VIII. who conferred the honour of knighthood on him, and employed him in several embassies; particularly in 1532, to Rome, about the divorce of queen Catharine, and afterwards to Charles V. about 1536. He wrote, *The Castle of Health*, *The Governor*, *Banquet of Sapience*, *Of the Education of Children*, *De rebus memorabilibus Anglie*, and other books; and was highly esteemed by all his learned contemporaries.

ELYSIUM, (ΕΛΥΣΙΟΣ,) in the ancient theology, or rather mythology, a place in the *inferi* or lower world, furnished with fields, meads, agreeable woods, groves, shades, rivers, &c. whither the souls of good people were supposed to go after this life.

Orpheus, Hercules, and Æneas, are supposed to have descended into Elysium in their life-time, and to have returned again; (Virg. lib. vi. ver. 638, &c.) *Tibullus* (lib. i. eleg. 3.) gives us fine descriptions of the Elysian fields.

Virgil opposes Elysium to Tartarus; which was the place where the wicked underwent their punishment.

*Hic locus est, partes ubi se via findit in ambas:
Dextera, quæ Ditis magni sub mania tendit:
Hic iter Elysium nobis: at læva malorum
Exercet pœnas, & ad impia Tartara mittit.*

He assigns Elysium to those who died for their country, to those of pure lives, to truly inspired poets, to the inventors of arts, and to all who have done good to mankind.

Some authors take the fable of Elysium to have been borrowed from the Phœnicians; as imagining the name *Elysium* formed from the Phœnician *עלז* *alaz*, or *עלז* *alaz*, or *עלז* *alaz*, "to rejoice," or "to be in joy;" the letter *a* being only changed into *e*, as we find done in many other names; as in *Enakim* for *Anakim*, &c. On which footing, Elysian fields should signify the same thing as a place of pleasure; or,

*Locos lætos, & amena vireta
Fortunatorum nemorum, sedesque beatas.*

Virg.

Others derive the word from the Greek *λυω* *solvo*, "I deliver, I let loose or disengage;" because here mens souls are freed or disincumbered from the fetters of the body. Beroaldus, and Hornius (*Hist. Philosoph. lib. iii. cap. 2.*) take the place to have derived its name from *Eliza*, one of the first persons who came into Greece after the deluge, and the author and father of the *Ætolians*.

The Elysian fields were, according to some, in the *Fortunate Islands* on the coast of Africa; in the *Atlantic*. Others place them in the island of *Leuce*; and according to the authority of *Virgil*, they were situated in Italy. According to *Lucian*, they were near the moon; or in the centre of the earth, if we believe *Plutarch*. *Olaus Wormius* contends that it was in Sweden the Elysian fields were placed.

ELZEVIRS, celebrated printers at Amsterdam and Leyden, who greatly adorned the republic of letters by many beautiful editions of the best authors of antiquity. They fell somewhat below the *Stephenes* in point of learning, as well as in their editions of Greek and Hebrew authors; but as to the choice of good books, they seem to have equalled, and in the neatness and elegance of their small characters, greatly to have exceeded them. Their *Virgil*, *Terence*, and Greek Testament, have been reckoned their masterpieces; and are indeed so very fine, that they justly gained them the reputation of being the best printers in Europe. There were five of these *Elzevirs*, namely, *Lewis*, *Bonaventure*, *Abraham*, *Lewis*, and *Daniel*. *Lewis* began to be famous at Leyden in 1595, and was remarkable for being the first who observed the distinction between the *v* consonant and *u* vowel, which had been recommended by *Ramus* and other writers long before, but never regarded. *Daniel* died in 1680 or 1681; and though he left children who carried on the business, passes nevertheless for the last of his family who excelled in it. The *Elzevirs* have printed several catalogues of their editions; but the last, published by *Daniel*, is considerably enlarged, and abounds with new books. It was printed at Amsterdam, 1674, in 12mo, and divided into seven volumes.

EMANATION, the act of flowing or proceeding from some source or origin. Such is the emanation of

Emanation light from the sun; or that of effluvia from odorous, &c. bodies; of wisdom from God, &c.—The word is formed of the Latin *e* “out of,” and *manare* “to flow or stream.”

Embalming

EMANATION is also used for the thing that proceeds, as well as the act of proceeding. The power given a judge is an emanation from the regal power; the reasonable soul is an emanation from the Divinity.

EMANCIPATION, in the Roman law, the setting free a son from the subjection of his father; so that whatever moveables he acquires belong in property to him, and not to his father, as before emancipation.

Emancipation puts the son in a capacity of managing his own affairs, and of marrying without his father's consent, though a minor. Emancipation differs from manumission, as the latter was the act of a master in favour of a slave, whereas the former was that of a father in favour of his son.

There were two kinds of emancipation: the one tacit, which was by the son's being promoted to some dignity, by his coming of age, or by his marrying, in all which cases he became his own master of course. The other, express; where the father declared before a judge, that he emancipated his son. In performing this, the father was first to sell his son imaginarily to another, whom they called *pater fiduciarius*, father in trust; of whom being bought back again by the natural father, he manumitted him before the judge by a verbal declaration.

Emancipation still obtains in France with regard to minors or pupils, who are hereby set at liberty to manage their own effects, without the advice or direction of their parents or tutors.

EMARGINATED, among botanists. See BOTANY, p. 444, n° 181.

EMASCULATION, the act of castrating or depriving a male of those parts which characterize his sex. See CASTRATION, and EUNUCH.

EMAUS, EMMAUS, or *Ammaus*, (anc. geog.), a village, 60 stadia to the north-west of Jerusalem, or about seven miles: it afterwards became a town, and a Roman colony, *Nicopolis*, (Jerome). Reland has another *Emmaus* towards Lydda, 22 miles from Jerusalem, (Itinerary); a third, near Tiberias.

EMBALMING, is the opening a dead body, taking out the intestines, and filling the place with odoriferous and desiccative drugs and spices, to prevent its putrifying. The Egyptians excelled all other nations in the art of preserving bodies from corruption; for some that they have embalmed upwards of 2000 years ago, remain whole to this day, and are often brought into other countries as great curiosities. Their manner of embalming was thus: they scooped the brains with an iron scoop out at the nostrils, and threw in medicaments to fill up the vacuum: they also took out the entrails, and having filled the body with myrrh, cassia, and other spices, except frankincense, proper to dry up the humours, they pickled it in nitre, where it lay soaking for 70 days. The body was then wrapped up in bandages of fine linen and gums, to make it stick like glue; and so was delivered to the kindred of the deceased, entire in all its features, the very hairs of the eye-lids being preserved. They used

to keep the bodies of their ancestors, thus embalmed, in little houses magnificently adorned, and took great pleasure in beholding them, alive as it were, without any change in their size, features, or complexion. The Egyptians also embalmed birds, &c. The prices for embalming were different; the highest was a talent, the next 29 minæ, and so decreasing to a very small matter: but they who had not wherewithal to answer this expence, contented themselves with infusing, by means of a syringe, through the fundament, a certain liquor extracted from the cedar; and, leaving it there, wrapped up the body in salt of nitre: the oil thus preyed upon the intestines, so that when they took it out, the intestines came away with it, dried, and not in the least putrified: the body being enclosed in nitre, grew dry, and nothing remained besides the skin glued upon the bones.

The method of embalming used by the modern Egyptians, according to Maillet, is to wash the body several times with rose-water, which, he elsewhere observes, is more fragrant in that country than with us; they afterwards perfume it with incense, aloes, and a quantity of other odours, of which they are by no means sparing; and then they bury the body in a winding sheet, made partly of silk and partly of cotton, and moistened, as is supposed, with some sweet-scented water or liquid perfume, though Maillet uses only the term *moistened*; this they cover with another cloth of unmixed cotton, to which they add one of the richest suits of clothes of the deceased. The expence, he says, on these occasions, is very great, though nothing like what the genuine embalming cost in former times.

EMBARCADERO, in commerce, a Spanish term, much used along the coasts of America, particularly those on the side of the South Sea. It signifies a place which serves some other considerable city farther within land, for a port or place of shipping, *i. e.* of embarking and disembarking commodities. Thus Calao is the embarcadero of Lima, the capital of Peru; and Arica the embarcadero of Potosi. There are some embarcaderos 40, 50, and even 60 leagues off the city, which they serve in that capacity.

EMBARGO, in commerce, an arrest on ships or merchandise, by public authority; or a prohibition of state, commonly on foreign ships, in time of war, to prevent their going out of port, sometimes to prevent their coming in, and sometimes both, for a limited time.

The king may lay embargoes on ships, or employ those of his subjects, in time of danger, for the service and defence of the nation: but they must not be for the private advantage of a particular trader or company; and therefore a warrant to stay a single ship is no legal embargo. No inference can be made from embargoes which are only in war-time; and are a prohibition by advice of council, and not at prosecution of parties. If goods be laden on board, and after an embargo or restraint from the prince or state comes forth, and then the master of the ship breaks ground, or endeavours to sail, if any damage accrues, he must be responsible for the same; the reason is, because his freight is due, and must be paid, even tho' the goods be seized as contraband.

EMBARRASS,

Embarrass

||

Emberiza.

EMBARRASS, (*Embarraſſment*), a French term, though now naturalized; denoting a difficulty or obstacle which perplexes or confounds a person, &c.

EMBASSADOR. See AMBASSADOR.

EMBASSY, the office or function of an AMBASSADOR.

EMBDEN, a port-town and city of Germany, capital of a county of the same name, now in possession of the king of Prussia; it is situated at the mouth of the river Ens. E. Long. 6. 45. N. Lat. 53. 50.

EMBER-WEEKS, are those wherein the *ember* or *embring days* fall.

In the laws of king Alfred, and those of Canute, those days are called *ymbren*, that is, circular days, from whence the word was probably corrupted into *ember-days*: by the canonists they are called *quatuor anni tempora*, the four cardinal seasons, on which the circle of the year turns: and hence Henshaw takes the word to have been formed, viz. by corruption from *temper* of *tempora*.

The ember-days are, the Wednesday, Friday, and Saturday, after Quadragesima Sunday, after Whitsunday, after Holy-rood day in September, and after St Lucia's day in December: which four times answer well enough to the four quarters of the year, Spring, Summer, Autumn, and Winter.

Mr Somner thinks they were originally fasts, instituted to beg God's blessing on the fruits of the earth. Agreeably to which, Skinner supposes the word *ember* taken from the ashes, *embers*, then strewed on the head.

These ember-weeks are now chiefly taken notice of, on account of the ordination of priests and deacons; because the canon appoints the Sundays next succeeding the ember-weeks, for the solemn times of ordination: Though the bishops, if they please, may ordain on any Sunday or holiday.

EMBERIZA, in ornithology, a genus of birds belonging to the order of passerines. The bill is conical, and the mandibles recede from each other towards the base; the inferior mandible has the sides narrowed inwards, but the upper one is still narrower. The most remarkable species are,

1. The *nivalis*, or great pyed mountain-finch of Ray, and the snow-bird of Edwards, has white wings, but the outer edge of the prime-feathers are black; the tail is black, with three white feathers on each side. These birds are called in Scotland *snow-flakes*, from their appearance in hard weather and in deep snows. They arrive in that season among the Cheviot-hills and in the Highlands in amazing flocks. A few breed in the Highlands, on the summit of the highest hills, in the same places with the *ptarmigans*; but the greatest numbers migrate from the extreme north. They appear in the Shetland islands; then in the Orkneys; and multitudes of them often fall, wearied with their flight, on vessels in the Pentland Frith. Their appearance is a certain fore-runner of hard weather, and storms of snow, being driven by the cold from their common retreats. Their progress southward is probably thus; Spitzbergen and Greenland, Hudson's Bay, the Lapland Alps, Scandinavia, Iceland, the Ferroe Isles, Shetland, Orkneys, Scotland, and the Chivot-hills. They visit at that season all parts of the northern hemisphere, Prussia, Austria, and Siberia. They arrive lean, and return fat. In Austria, they are caught and

fed with millet, and, like the ortolan, grow excessively fat. In their flights, they keep very close to each other, mingle most confusedly together, and fling themselves collectively into the form of a ball; at which instant the fowler makes great havock among them.

2. The *miliaris*, or grey emberiza, is of a greyish colour, spotted with black in the belly, and the orbits are reddish. It is the bunting of English authors, and a bird of Europe.

3. The *hortulana*, or ortolan, has black wings; the first three feathers on the tail are white on the edges, only the two lateral are black outwardly. The orbits of the eyes are naked and yellow; the head is greenish, and yellow towards the inferior mandible. It feeds principally upon the panick-grass; grows very fat; and is reckoned a delicate morsel by certain epicures, especially when fattened artificially. These birds are found in several parts of Europe, but are not met with in Britain; are common in France and Italy, and some parts of Germany and Sweden, migrating from one to the other in spring and autumn; and in their passage are caught in numbers, in order to fatten for the table. This species will sometimes sing very prettily, and has been kept for that purpose. The song is not unlike that of the yellow-hammer, but finer and sweeter. In some parts it makes the nest in a low hedge; in others, on the ground. It is carelessly constructed, not unlike that of the lark. The female lays four or five greyish eggs, and in general has two broods in a year.

The manner of fattening these birds for the table is as follows. They are taken and placed in a chamber lightened by lanthorns; so that, not knowing the vicissitudes of day and night, they are not agitated by the change. Are fed with oats and millet; and grow so fat, that they would certainly die if not killed in a critical minute. They are a mere lump of fat; of a most exquisite taste, but apt soon to satiate. These birds receive both their Greek and Latin name from their food, the millet. Aristotle calls them *cynchromis*; and the Latins, *miliaria*. The latter kept and fattened them in their *ornithones*, or fowl-yards, as the Italians do at present; which the ancients constructed with the utmost magnificence, as well as conveniency.

4. The *citrinella*, or yellow-hammer, has a blackish tail, only the two outward side-feathers are marked on the inner edge with a sharp white spot. It is a bird of Europe, and comes about houses in winter: it builds its nest on the ground on meadows.

5. The *schœniclas*, or reed-sparrow, has a black head, a blackish-grey body, and a white spot on the quill-feathers. It inhabits marshy places, most commonly among reeds, from which it takes its name. Its nest is worthy of notice for the artful contrivance of it, being fastened to four reeds, and suspended by them like a hammock, about three feet above the water; the cavity of the nest is deep, but narrow; and the materials are bushes, fine bents, and hairs. It lays four or five eggs of a bluish white, marked with irregular purplish veins, especially on the larger end. It is a bird much admired for its song; and, like the nightingale, it sings in the night.

6. The *oryzivora*, or rice-bunting, with the head and whole under side of the body black; hind part of the

Emberiza,
Emblem

neck in some pale yellow, and in others white; coverts of the wings, and primaries, black, the last edged with white; part of the scapulars, lesser coverts of the wings, and rump, white; back black, edged with dull yellow; tail of the same colours, and each feather sharply pointed; the legs are red. The head, upper part of the neck, and back, of the female, is yellowish brown, spotted with black; the under part, of a dull yellow; the sides thinly streaked with black.

These birds inhabit in vast numbers the island of Cuba, where they commit great ravages among the early crops of rice, which precede those of Carolina. As soon as the crops of that province are to their palate, they quit Cuba, and pass over the sea, in numerous flights, directly north; and are very often heard in their passage by sailors frequenting that course. Their appearance is in September, while the rice is yet milky; and commit such devastations, that 40 acres of that grain have been totally ruined by them in a small time. They arrive very lean: but soon grow so fat, as to fly with difficulty; and, when shot, often burst with the fall. They continue in Carolina not much above three weeks, and retire by the time the rice begins to harden; going on to other parts, and staying in each only so long as the rice continues green. They come into Rhode Island and New York at the end of April, or the second week in May, frequenting the borders of fields, and live on insects, &c. till the maize is fit for their palate; when they begin by pecking holes in the sides of the husks, and after satiating themselves go on to another; which leaves room for the rain to get in, and effectually spoils the plants. They continue there during the summer, and breed; returning, as autumn approaches, to the southward. The males and females do not arrive together; the females come first.—They are esteemed to be the most delicate birds of those parts; and the male is said to have a fine note. This species is known in the country by the names of *bob lincoln* and *conquedle*; likewise called by some the *white-backed maize-thief*.

There are above 50 other species; two of which, viz. the black-throated bunting a native of America, and the cinereous bunting an inhabitant of Canada, are figured on Plate CLXXXII. as specimens of the genus.

EMBLEM, a kind of painted ænigma, which, representing some obvious history, with reflections underneath, instructs us in some moral truth or other matter of knowledge. See DEVISE, ÆNIGMA, &c.

Such is that very significant image of Scævola holding his hand in the fire; with the words, *Agere et pati fortiter Romanum est*, "To do and suffer courageously is Roman."

The word is pure Greek, formed of the verb *εμβαλλειν*, "to cast in, to insert." Suetonius relates, that Tiberius made the word be erased out of the decree of the Roman senate, because borrowed from another language.

The emblem is somewhat plainer and more obvious than the ænigma.—Gale defines emblem an ingenious picture, representing one thing to the eye, and another to the understanding.

The Greeks also gave the name EMBLEMS, *εμβληματα*, to inlaid or Mosaic works, and even to all kinds of ornaments of vases, moveables, garments, &c. And

the Latins used *emblema* in the same sense. Accordingly, Cicero reproaching Verres with the statues and fine wrought works he had plundered from the Sicilians, calls the ornaments fixed thereto (and which on occasion might be separated from them) *emblemata*. Add, that Latin authors frequently compare the figures and ornaments of discourse to these *emblemata*. Thus, an ancient Latin poet praising an orator, says, that all his words were ranged like the pieces in Mosaic:

*Quam lepide veritas composita, ut tessellæ omnes,
Arte pavimenti, atque emblemate vermiculato.*

With us, emblem ordinarily signifies no more than a painting, basso-relievo, or other representation, intended to hold forth some moral or political instruction.

What distinguishes an emblem from a devise is, that the words of an emblem have a full complete sense of themselves; nay, all the sense and signification which they have together with the figure. But there is a yet further difference between emblem and devise: for a devise is a symbol appropriated to some person, or that expresses something which concerns him particularly; whereas an emblem is a symbol that regards all the world alike.

These differences will be more apparent, from comparing the emblem above quoted, with the devise of a candle lighted, and the words *Juvando consumor*, "I waste myself in doing good." See DEVISE.

EMBOLISMUS, *εμβολισμος*, in chronology, signifies "intercalation." The word is formed of *εμβαλλειν*, "to insert."

As the Greeks made use of the lunar year, which is only 354 days, in order to bring it to the solar, which is 365 days, they had every two or three years an embolism, i. e. they added a 13th lunar month every two or three years, which additional month they called *embolimus*, *εμβολιμαιος*, because inserted, or intercalated.

EMBOSSING, or IMBOSSING, in architecture and sculpture, the forming or fashioning works in relievo, whether cut with a chisel or otherwise.

Embossing is a kind of sculpture, wherein the figures stick out from the plane whereon it is cut: and according as the figures are more or less prominent, they are said to be in alto, mezzo, or basso, relievo; or high, mean, or low, relief. See ENCHASING.

EMBOTHRIUM, in botany: A genus of the monogynia order, belonging to the tetrandria class of plants. There is no calyx; the corolla consists of four linear oblique petals; the stamina are four very short filaments; the antheræ are pretty large, oblong, and seated within the cavity of the petal. The pericarpium is a round unilocular follicle, sharpened at both ends; the seeds are four or five in number, egg-shaped, and compressed.

EMBRASURE, in architecture, the enlargement made of the aperture of a door or window, on the inside of the wall; its use being to give the greater play for the opening of the door or casement, or to admit the more light.

EMBROCATION, in surgery and pharmacy, an external kind of remedy, which consists in an irrigation of the part affected, with some proper liquor, as oils, spirits, &c. by means of a woollen or linen cloth, or a sponge, dipped in the same.

EMBROIDERY, a work in gold, or silver, or silk thread, wrought by the needle upon cloth, stuffs, or muslin,

Embolif-
mus
||
Embroidery.

Embroidery
||
Emerald.

muslin, into various figures. In embroidering stuffs, the work is performed in a kind of loom; because the more the piece is stretched, the easier it is worked. As to muslin, they spread it upon a pattern ready designed; and sometimes, before it is stretched upon the pattern, it is starched, to make it more easy to handle. Embroidery on the loom is less tedious than the other, in which, while they work flowers, all the threads of the muslin, both lengthwise and breadthwise, must be continually counted; but, on the other hand, this last is much richer in points, and susceptible of greater variety. Cloths too much milled are scarce susceptible of this ornament, and in effect we seldom see them embroidered. The thinnest muslins are left for this purpose; and they are embroidered to the greatest perfection in Saxony: in other parts of Europe, however, they embroider very prettily, and especially in France.

There are several kinds of embroidery: as, 1. Embroidery on the stamp; where the figures are raised and rounded, having cotton or parchment put under them to support them. 2. Low embroidery; where the gold and silver lie low upon the sketch, and are stitched with silk of the same colour. 3. Guimped embroidery: this is performed either in gold or silver; they first make a sketch upon the cloth, then put on cut vellum, and afterwards sew on the gold and silver with silk thread: in this kind of embroidery they often put gold and silver cord, tinsel, and spangles. 4. Embroidery on both sides; that which appears on both sides of the stuff. 5. Plain embroidery; where the figures are flat and even, without cords, spangles, or other ornaments.

By stat. 22. Geo. II. c. 36. no foreign embroidery, or gold and silver brocade, shall be imported, upon pain of being forfeited and burnt, and penalty of 100l. for each piece. No person shall sell, or expose to sale, any foreign embroidery, gold or silver thread, lace, fringe, brocade, or make up the same into any garment, on pain of having it forfeited and burnt, and penalty of 100l. All such embroidery, &c. may be seized and burnt; and the mercer, &c. in whose custody it was found, shall forfeit 100l.

EMBRUN, or AMBRUN, a city of Dauphiny, in France, near the confines of Piedmont. E. Long. 6. 6. N. Lat. 44. 35.

EMBRYO, in physiology, the first rudiments of an animal in the womb, before the several members are distinctly formed; after which period it is denominated a *fetus*. See GENERATION, and FETUS.

EMERALD, a genus of precious stones belonging to the order of siliceous earths. The word is derived, according to some, from the French *esmaraude*, and that from the Latin *smaragdus*, signifying the same thing; by others it is said to be derived from the Italian *smeraldo*, or the Arabian *zomorrad*. According to Cronstedt the emerald is the softest of all the precious stones, though other naturalists place it the next after the diamond in this respect. It is perhaps the most beautiful of all the gems, and, according to Wallerius, when heated in the fire, changes its colour to a deep blue, and becomes phosphorescent; but recovers its green colour when cold. When pulverised it has a white appearance, and, with borax, melts to a very thin and colourless glass. It becomes electric by being rubbed, and some have the property of the tourmalin, viz. of

being electrified by heat, and in that state attracting ashes or other light substances; though the emeralds are less powerful than the tourmalin, and after having attracted the ashes, they retain them without any signs of repulsion.

Pliny mentions twelve different kinds of these precious stones; though it appears, from the vast size of some of them, that they must have been only certain kinds of green spar, or other green stone, which at that time went under the name of *emerald* among the ancients. The true emerald is found only in very small crystals, from the size $\frac{1}{8}$ th of an inch in diameter to that of a walnut. Theophrastus, however, mentions one four cubits long and three broad; likewise an obelisk composed of only four emeralds, the whole length being 40 cubits, and the breadth from four to two.

Engestroom informs us, that the emeralds, in their rough or native state, consist of hexagonal columns mostly truncated at both ends; and that he had some in his possession, which in a gentle heat became colourless; but in a strong heat white and opaque, without any mark of fusion. Brunick distinguishes them into two classes. 1. The pale green emerald, which comes from the east and from Peru, the figure being that of an hexagonal truncated prism, and the basis a vein of white quartz. 2. The dark green emerald, which is also columnar, but very dark-coloured, striped longitudinally, and has little transparency. The points are generally broken off longitudinally, though Davila mentions one resembling a blunt triangular pyramid; and in the Imperial cabinet at Vienna, there is one with a five-sided pyramid. These are the emeralds which become electrical by heat; though all of them do not; and those which do so cannot be known but by actual experiment. The finest specimen of the former kind of emeralds is to be seen in the treasure of the holy chapel of Loretto, containing upwards of 100 of these precious stones great and small. A fellow to this was made by art, and both were presents to the king of Sicily, designed to represent two mount Calvaries.

Emeralds are distinguished by the jewellers into two kinds, the oriental and occidental. The true oriental emerald is very scarce, and at present only found in the kingdom of Cambay. So great indeed is the scarcity of them, that an opinion prevailed that there are no oriental emeralds. This opinion is adopted, among others, by Mr Bruce; who informs us, that he made an excursion to the island of emeralds in the Red Sea, and endeavours to show that there never were any emeralds but what came from America, and that those said to have been found in the East Indies were imported from that continent. It is probable indeed, that in former times any kind of crystal tinged of a green colour might be called an *emerald*, and hence the green cochle spar brought from Egypt may have obtained the name of *mother of emeralds*; but of late some emeralds have been brought from Cambay into Italy which greatly excelled those of America. The best emeralds of the western continent come from Peru, and are called *oriental* by the jewellers: some are found in Europe, principally in the duchy of Silesia in Germany.

Rough EMERALDS.—Those of the first and coarsest sort, called *plafmes*, for grinding, are worth 27 shillings sterling the marc, or 8 ounces. The demi-morillons, 8l. sterl. per marc. Good morillons, which are only little pieces,

Emerald.

Emerald
||
Emerson.

pieces, but of fine colour, from 13l. to 15l. per marc. Emeralds, larger than morillons, and called *of the third colour* or *fort*, are valued at from 50l. to 60l. the marc. Emeralds, called *of the second fort*, which are in larger and finer pieces than the preceding, are worth from 65l. to 75l. per marc. Lastly, those of the first colour, otherwise called *negres cartes*, are worth from 110l. to 115l.

EMERALDS ready cut, or polished and not cut, being of good stone, and a fine colour, are worth,

	L.	s.
Those weighing one caract, or four grains	0	10
Those of two caracts	1	7
Those of three caracts	2	5
Those of four caracts	3	10
Those of five caracts	4	10
Those of six caracts	7	10
Those of seven caracts	15	0
Those of eight caracts	19	0
Those of nine caracts	23	0
Those of ten caracts	33	0

To counterfeit EMERALDS: Take of natural crystal, four ounces; of red-lead, four ounces; verdegriis, forty-eight grains; crocus martis, prepared with vinegar, eight grains: let the whole be finely pulverized and sifted; put this into a crucible, leaving one inch empty: lute it well, and put it into a potter's furnace, and let it stand there as long as they do their pots. When cold, break the crucible; and you will find a matter of a fine emerald colour, which, after it is cut and set in gold, will surpass in beauty an oriental emerald.

EMERSION, in physics, the rising of any solid above the surface of a fluid specifically heavier than itself, into which it had been violently immersed or thrust.

It is one of the known laws of hydrostatics, that a lighter solid being forced down into a heavier fluid, immediately endeavours to emerge; and that with a force or moment equal to the excess of weight of a quantity of the fluid above that of an equal bulk of the solid. Thus, if a solid be immersed in a fluid of double its specific gravity, it will emerge again till half its bulk or body be above the surface of the fluid.

EMERSION, in astronomy, is when the sun, moon, or other planet, begins to re-appear, after its having been eclipsed, or hid by the interposition of the moon, earth, or other body.

The difference of longitude is sometimes found by observing the immersions and emersions of the first of Jupiter's satellites. The immersions are observed from the time of Jupiter's being in conjunction with the sun to his opposition; and the emersion, from the opposition to the conjunction; which two intervals are usually six months a-piece, and divide the year between them. But when Jupiter is in conjunction with the sun, and 15 days before and afterwards, there is nothing to be observed; the planet, with his satellites, being then lost in the light of the sun.

EMERSION is also used when a star, before hid by the sun, as being too near him, begins to re-appear, and to get out of his rays.

EMERSON (William), a late eminent mathematician, was born in June 1701, at Hurworth, a village

Nº 115.

about three miles south of Darlington; at least it is certain that he resided here from his childhood. His father Dudley Emerson was a tolerable proficient in mathematics; and without his books and instructions, perhaps his own genius (most eminently fitted for mathematical disquisitions) would have never been unfolded. He was instructed in the learned languages by a young clergyman, then curate of Hurworth, who was boarded at his father's house. In the earlier part of his life he attempted to teach a few scholars: but whether from his concise method (for he was not happy in explaining his ideas), or the warmth of his natural temper, he made no progress in his school: he therefore soon left it off; and satisfied with a moderate competence left him by his parents, he devoted himself to a studious retirement. Towards the close of the year 1781 (being sensible of his approaching dissolution), he disposed of the whole of his mathematical library to a bookseller at York; and on May 20th 1782, he died of a lingering and painful disorder at his native village, aged near 81 years.

Mr Emerson in his person was rather short, but strong and well-made, with an open countenance and ruddy complexion. He was exceedingly singular in his dress. He had but one coat, which he always wore open before, except the lower button; no waistcoat; his shirt quite the reverse of one in common use, no opening before, but buttoned close at the collar behind; a kind of flaxen wig which had not a crooked hair in it, and probably had never been tortured with a comb from the time of its being made. He always walked up to London when he had any thing to publish, revising sheet by sheet himself:—Trusting no eyes but his own, was always a favourite maxim with him. He never advanced any mathematical proposition that he had not first tried in practice, constantly making all the different parts himself on a small scale, so that his house was filled with all kinds of mechanical instruments together or disjointed. He would frequently stand up to his middle in water while fishing, a diversion he was remarkably fond of. He used to study incessantly for some time, and then for relaxation take a ramble to any pot-alley where he could get any body to drink with and talk to. The duke of Manchester was highly pleased with his company, and used often to come to him in the fields and accompany him home, but could never persuade him to get into a carriage. On these occasions he would sometimes exclaim, "Damn your whim-wham! I had rather walk." He was a married man; and his wife used to spin on an old-fashioned wheel, whereof a very accurate drawing is given in his mechanics. He was deeply skilled in the science of music, the theory of sounds, and the various scales both ancient and modern, but was a very poor performer.

The following is a list of Mr Emerson's works. 1. The Doctrine of Fluxions. 2. The Projection of the Sphere, orthographic, stereographic, and gnomonical. 3. The Elements of Trigonometry. 4. The Principles of Mechanics. 5. A Treatise of Navigation on the Sea. 6. A Treatise of Algebra, in two books. 7. The Arithmetic of Infinites, and the differential Method, illustrated by Examples. 8. Mechanics; or the Doctrine of Motion. 9. The Elements of Optics, in four books. 10. A System of Astronomy.

11. The

Emery.

11. The Laws of Centripetal and Centrifugal Force.
 12. The Mathematical Principles of Geography.
 13. Tracts, 8vo. 14. Cyclomathesis; or an easy Introduction to the several Branches of the Mathematics. 15. A short Comment on Sir Isaac Newton's Principia; to which is added, A Defence of Sir Isaac against the Objections that have been made to several Parts of his Works. 16. A Miscellaneous Treatise, containing several Mathematical Subjects, 8vo. 1776.

EMERY, in natural history, a rich iron-ore found in large masses of no determinate shape or size, extremely hard, and very heavy. It is usually of a dusky brownish red on the surface; but when broken, is of a fine bright iron-grey, but not without some tinge of redness; and is spangled all over with shining specks, which are small flakes of a foliaceous talk, highly impregnated with iron. It is also sometimes very red, and then usually contains veins of gold. It makes no effervescence with any of the acid menstruums; and is found in the island of Guernsey, in Tuscany, and many parts of Germany.

Phil. Com.
 p. 607.

Dr Lewis is of opinion, that some kinds of emery may contain the metal called *platina*, and on this subject has the following curious observations. "Alonso Barba mentions a substance called *chumpi*; which is a hard stone of the emery kind, participating of iron, of a grey colour shining a little, very hard to work, because it resists the fire much, found in Potosi, Chocaya, and other places, along with blackish and reddish ores that yield gold. If platina is really found in large masses, either generally or only now and then, one might reasonably expect those masses to be such as are here described.

"Of the same kind perhaps also is the mineral mentioned by several authors under the name of Spanish emery, *smiris Hispanica*, which should seem, from the accounts given of it, to be no other than platina or its matrix. The *smiris* is said to be found in the gold mines, and its exportation prohibited; to contain films or veins of native gold; to be in great request among the alchemists; to have been sometimes used for the adulteration of gold; to stand, equally with the noble metal, cupellation, quartation, antimony, and the regal cement; and to be separable from it by amalgamation with mercury, which throws out the *smiris* and retains the gold; properties strongly characteristic of platina, and which do not belong to any known substance besides. This debasement of gold *per extractum smiridis Hispanici* is mentioned by Becher in his *Minera arenaria*, and several times hinted at in his *Physica subterranea*. Both Becher and Stahl indeed call the substance which the gold receives from the emery an earth, whereas platina is undoubtedly a metal; but this does not at all invalidate our supposition, for they give the name of earth also to the substance which copper receives from calamine in being made into brass, which is now known to be metallic.

"From these observations I have been led to suspect, that the European emeries likewise might possibly participate of platina. If this was certain, it would account satisfactorily for the use which some of the alchemists are said to have made of emeries and other ferrugineous ores; and we should no longer doubt, or wonder, that by treating gold with these kinds of minerals, they obtained a permanent augmen-

tation; that this augmentation, though it resisted lead, antimony, aquafortis, and the regal cement, was separable, as Becher owns it was, by quicksilver; and that, when it exceeded certain limits, it rendered the gold pale and brittle.

"If emery contains platina, I imagined it might be discoverable by boiling the powdered mineral in melted lead, and afterwards working off the lead upon a test or cupel. The experiment was made with eight ounces of the finest powder of common emery, and the same quantity of lead; which were covered with black flux to prevent the scorification of the lead, and urged with a strong fire for two or three hours. The lead became hard, rigid, of a dark colour, and a granulated texture, as if it had really imbibed some platina from the emery; but in cupellation it worked almost entirely off, leaving only a bead about the size of a small pin's head, which was probably no other than silver contained in the lead.

"I repeated the experiment with some variation, thinking to obtain a more perfect resolution of the emery by vitrifying it with the lead. Two ounces of fine emery and six ounces of minium were well mixed together, and urged with a strong fire, in a close crucible, for an hour: they melted into an uniform dark brownish glass. The glass was powdered, mixed with four ounces of fixt alkaline salt and some powdered charcoal, and put into a fresh crucible, with some common salt on the surface: The fire was pretty strongly excited; but the fusion was not so perfect as could be wished, and only about two ounces of lead were found revived. This lead had suffered nearly the same change as that in the foregoing experiment; and, like it, gave no appearance of platina on being cupelled.

"It seems to follow from these experiments, that the emery employed in them contained no platina; but as it is not to be supposed that all emeries are of one composition, other sorts may deserve to be submitted to the same trials. As gold is contained in some parcels of common minerals, and by no means in all the individuals of any one species; platina may possibly in like manner be found in some European ores, though there is not the least footstep of it in other parcels of the same kind of ore."

EMETICS, medicines that induce vomiting.

EMIMS, ancient inhabitants of the land of Canaan beyond Jordan, who were defeated by Chedorlaomer and his allies, Gen. xiv. 5. Moses tells us, that they were beaten in Shaveh Kirjathaim, which was in the country of Sihon conquered from the Moabites, Josh. xiii. 19—21. The Emims were a warlike people, of a gigantic stature, great and many, and tall as the Anakims.

EMINENCE, in geography, a little hillock or ascent above the level of the adjoining champaign.

EMINENCE is also a title of honour given to cardinals. The decree of the pope, whereby it was appointed that the cardinals should be addressed under the quality of *eminence*, bears date the 10th of January 1630. They then laid aside the titles of *illustrissimi*, and *reverendissimi*, which they had borne before.

The grand master of Malta is likewise addressed under the quality of *eminence*. The popes John VIII. and Gregory VII. gave the same title to the kings of France. The emperors have likewise borne it.

Emery
 ||
 Eminence.

Emir
||
Emmius.

Eminentissimus, the superlative of *eminent*, has of late been attributed to the cardinals.

EMIR, a title of dignity among the Turks, signifying a prince.

This title was first given to the caliphs; but when they assumed the title of Sultans, that of emir remained to their children; as that of Cæsar among the Romans. At length the title came to be attributed to all who were judged to descend from Mahomet by his daughter Fatimah, and who wear the green turban instead of the white. The Turks make an observation, that the emirs, before their fortieth year, are men of the greatest gravity, learning, and wisdom; but after this, if they are not great fools, they discover some signs of levity and stupidity. This is interpreted by the Turks as a sort of divine impulse in token of their birth and sanctity. The Turks also call the vizirs, bashaws, or governors of provinces, by this name.

EMISSARY, in a political sense, a person employed by another to sound the opinions of people, spread certain reports, or act as a spy over other people's actions.

EMISSARY-Vessels, in anatomy, the same with those more commonly called EXCRETORY.

EMISSION, in medicine, a term used chiefly to denote the ejaculation of the semen or seed in the act of coition. See COITION, and GENERATION.

EMMANUEL, or IMMANUEL, a Hebrew word which signifies, 'God with us.' Isaiah (viii. 14.), in that celebrated prophecy, wherein he declares to Ahaz the birth of the Messiah, who was to be born of a virgin, says, This child shall be called, and really be, Emmanuel, that is, *God with us*. The same prophet (viii. 8.) repeats the same thing, while he is speaking of the enemy's army, which, like a torrent, was to overflow Judea. 'The stretching out of his wings shall fill the breadth of thy land, O Emmanuel.' The evangelist Matthew (i. 23.) informs us, that this prophecy was accomplished in the birth of Christ, born of the virgin Mary, in whom the two natures divine and human were united, and so in this sense he was really Emmanuel, or 'God with us.'

EMMERICK, a rich fortified town of Germany, in the circle of Westphalia, and duchy of Cleves. It carries on a good trade with the Dutch, and both Protestants and Catholics have the free exercise of their religion. The streets are neat and regular, and the houses tolerably built. It was taken by the French in 1672, and delivered to the elector of Brandenburg in 1673, under whose jurisdiction it now is. It is seated near the Rhine. E. Long. 5. 29. N. Lat. 52. 5.

EMMIUS (Ubbo), born at Gretha in East Friesland in 1547, was a very learned professor, and chosen rector of the college of Norden in 1579. This seminary flourished exceedingly under his care; and declined as visibly after he was ejected, in 1587, for refusing to subscribe the Confession of Augsburg. The year after, he was made rector of the college of Leer; and when the city of Groningen confederated with the United Provinces, the magistrates appointed him rector of that college: which employment he filled with the highest repute near 20 years; until, the college being erected into an university, he was the first rector, and one of the chief ornaments of it by his lectures, till his infirmities prevented his public appearance. His

wisdom was equal to his learning; so that the governor of Friesland and Groningen often consulted him, and seldom failed to follow his advice. He wrote *Vetus Græcia illustrata*, 3 vols; *Decades Rerum Frest-carum*; and many other valuable works. He died in 1625.

EMMENAGOGUES, *Εμμεναγωγὰ*, in medicine, such remedies as promote the menstrual discharge. They are thus called from *εμ* "in," *μην* "month," *αγω* *duco*, "I lead," because their natural periods of flowing are once a-month.

EMOLLIENTS, in medicine and pharmacy, are such remedies as sheath and soften the asperity of the humours, and relax and supple the solids at the same time.

EMOLUMENT, is properly applied to the profits arising daily from an office or employ. The word is formed of the Latin *emolumentum*, which according to some, primarily signifies the profits redounding to the miller from his mill; of *molo*, *molere*, "to grind."—The patent, or other instrument, whereby a person is preferred to an office, gives him a right to enjoy all the dues, honours, profits, and emoluments belonging thereto.—*Emolument* is also used, in a somewhat greater latitude, for profit or advantage in the general.

EMOTION and PASSION, in the human mind, are thus distinguished by a celebrated writer*. An internal motion or agitation of the mind, when it passeth away without desire, is denominated *an emotion*: when desire follows, the motion or agitation is denominated *a passion*. A fine face, for example, raiseth in me a pleasant feeling: if that feeling vanish without producing any effect, it is in proper language an *emotion*; but if the feeling, by reiterated views of the object, becomes sufficiently strong to occasion desire, it loses its name of emotion, and acquires that of *passion*. The same holds in all the other passions. The painful feeling raised in a spectator by a slight injury done to a stranger, being accompanied with no desire of revenge, is termed an emotion; but that injury raiseth in the stranger a stronger emotion, which being accompanied with desire of revenge, is a passion. External expressions of distress produce in the spectator a painful feeling, which being sometimes so slight as to pass away without any effect, is an emotion; but if the feeling be so strong as to prompt desire of affording relief, it is a passion, and is termed *pity*. Envy is emulation in excess: if the exaltation of a competitor be barely disagreeable, the painful feeling is an emotion; if it produce desire to depress him, it is a passion. See PASSION.

EMOUY, or HIA-MEN, an island and port of China, under the jurisdiction of the province of FO-KIEN.

The port is properly but an anchoring-place for ships, inclosed on one side by the island from which it takes its name, and on the other by the main-land: but it is so extensive, that it can contain several thousands of vessels; and the depth of its water is so great, that the largest ships may lie close to the shore without danger.

In the beginning of the present century it was much frequented by European vessels; but few visit it at present, as all the trade is carried on at Canton. The emperor keeps here a garrison of 6 or 7000 men, commanded by a Chinese general. In entering this road,

Emmena-
gogues
||
Emouy.

Elem. of
Criticism,
vol. i. p. 42.

Emouy. road, a large rock must be doubled which stands at the mouth of it, and divides it almost as the Mingant divides the harbour of Brest. This rock is visible, and rises several feet above the surface of the water.

The island of Emouy is particularly celebrated on account of the magnificence of its principal pagod, consecrated to the deity Fo. This temple is situated in a plain, terminated on one side by the sea, and on the other by a lofty mountain. Before it the sea, flowing through different channels, forms a large sheet of water which is bordered with turf of the most beautiful verdure. The front of this edifice is 180 feet in length, and its gate is adorned with figures in relief, which are the usual ornaments of the Chinese architecture. On entering, you find a vast portico, with an altar in the middle, on which is placed a gigantic statue of gilt brass, representing the god Fo, sitting cross-legged. Four other statues are placed at the corners of this portico, which are 18 feet high, although they represent people sitting. Each of these statues is formed from a single block of stone. They bear in their hands different symbols which mark their attributes, as formerly in Athens and Rome the trident and caduceus distinguished Neptune and Mercury. One holds a serpent in its arms, which is twisted round its body in several folds; the second has a bent bow and a quiver; the two others present, one a kind of battle-axe, and the other a guitar, or some instrument of the same kind.

After crossing this portico, you enter a square outer court, paved with large gray stones, the least of which is ten feet in length and four in breadth. At the four sides of this court arise four pavilions, which terminate in domes, and have a communication with one another by means of a gallery which runs quite round it. One of these contains a bell ten feet in diameter; the wooden-work which supports this heavy mass cannot be sufficiently admired. In the other is kept a drum of an enormous size, which the bonzes use to proclaim the days of new and full moon. It must be observed, that the clappers of the Chinese bells are on the outside, and made of wood in the form of a mallet. The two other pavilions contain the ornaments of the temple, and often serve to lodge travellers, whom the bonzes are obliged to receive. In the middle of this court is a large tower, which stands by itself, and terminates also in a dome, to which you ascend by a beautiful stone stair-case that winds round it. This dome contains a temple remarkably neat; the ceiling is ornamented with mosaic work, and the walls are covered with stone figures in relief, representing animals and monsters. The pillars which support the roof of this edifice are of wood varnished; and on festivals are ornamented with small flags of different colours. The pavement of the temple is formed of little shells, and its different compartments present birds, butterflies, flowers, &c.

The bonzes continually burn incense upon the altar, and keep the lamps lighted, which hang from the ceiling of the temple. At one extremity of the altar stands a brazen urn, which when struck sends forth a mournful sound: on the opposite side is a hollow machine of wood, of an oval form, used for the same purpose, which is to accompany with its sound their voices when they sing in praise of the tutelary idol of the pagod.

Emouy, Empalement. The god Poussa is placed on the middle of this altar, on a flower of gilt brass, which serves as a base, and holds a young child in his arms; several idols, which are no doubt subaltern deities, are ranged around him, and show by their attitudes their respect and veneration.

The bonzes have traced out on the walls of this temple several hieroglyphical characters in praise of Poussa; there is also to be seen an historical or allegorical painting in fresco, which represents a burning lake, in which several men appear to be swimming, some carried by monsters, others surrounded by dragons and winged serpents. In the middle of the gulph rises a steep rock, on the top of which the god is seated, holding in his arms a child, who seems to call out to those who are in the flames of the lake; but an old man, with hanging ears and horns on his head, prevents them from climbing to the summit of the rock, and threatens to drive them back with a large club. The bonzes are at a loss what answer to give, when any questions are asked them concerning this painting. Behind the altar is a kind of library, containing books which treat of the worship of idols.

On descending from this dome you cross the court, and enter a kind of gallery, the walls of which are lined with boards; it contains 24 statues of gilt brass, representing the same number of philosophers, ancient disciples of Confucius. At the end of this gallery you find a large hall, which is the refectory of the bonzes; and after having traversed a spacious apartment, you at length enter the temple of Fo, to which there is an ascent by a large stone stair-case. It is ornamented with vases full of artificial flowers (a work in which the Chinese excel); and here also are found the same kind of musical instruments as those mentioned before. The statue of the god is not to be seen but through a piece of black gauze, which forms a kind of veil or curtain before the altar. The rest of the pagod consists of several large chambers, exceedingly neat, but badly disposed; the gardens and pleasure grounds are on the declivity of the mountain; and a number of delightful grottos are cut out in the rock, which afford an agreeable shelter from the excessive heat of the sun.

There are several other pagods in the isle of Emouy; among which is one called *The Pagod of the Ten Thousand Stones*, because it is built on the brow of a mountain where there is a like number of little rocks, under which the bonzes have formed grottos and very pleasant covered seats. A certain rural simplicity reigns here, which captivates and delights.

Strangers are received by these bonzes with great politeness, and may freely enter their temples; but they must not attempt to gratify their curiosity fully, nor to enter those apartments into which they are not introduced, especially if they are accompanied by suspicious persons; for the bonzes, who are forbid under pain of severe punishment to have any intercourse with women, and who often keep them in private, might, from fear of being discovered, revenge themselves for too impertinent a curiosity.

EMPALEMENT, an ancient kind of punishment, which consisted in thrusting a stake up the fundament. The word comes from the French *empaler*, or the Italian *impalare*; or rather, they are all alike derived

Empanel- from the Latin *palus* "a stake," and the preposition
ling in, "in or into." We find mention of empaling in
|| Juvenal. It was frequently practised in the time of
Emperor. Nero, and continues to be so in Turkey.

EMPALEMENT of a Flower, the same with CALYX.

EMPANELLING. See IMPANELLING.

EMPARLANCE. See IMPARLANCE.

EMPEDOCLES, a celebrated philosopher and poet, was born at Agrigentum, a city in Sicily. He followed the Pythagorean philosophy, and admitted the metempsychosis. He constantly appeared with a crown of gold on his head; to maintain, by this outward pomp, the reputation he had acquired of being a very extraordinary man. Yet Aristotle says, that he was a great lover of liberty, extremely averse to state and command, and that he even refused a kingdom that was offered him. His principal work was a Treatise in verse on the Nature and Principles of Things. Aristotle, Lucretius, and all the ancients, make the most magnificent elogiums on his poetry and eloquence.

He taught rhetoric; and often alleviated the anxieties of his mind, as well as the pains of his body, with music. It is reported, that his curiosity to visit the flames of the crater of *Ætna* proved fatal to him. Some maintain that he wished it to be believed that he was a god; and that his death might be unknown, he threw himself into the crater and perished in the flames. His expectations, however, were frustrated; and the volcano by throwing up one of his sandals discovered to the world that Empedocles had perished by fire. Others report that he lived to an extreme old age; and that he was drowned in the sea about 440 years before the Christian era.

EMPEROR (*imperator*), among the ancient Romans, signified a general of an army, who, for some extraordinary success, had been complimented with this appellation. Thus Augustus, having obtained no less than twenty famous victories, was as often saluted with the title *emperor*; and Titus was denominated *emperor* by his army after the reduction of Jerusalem.

Afterwards, it came to denominate an absolute monarch or supreme commander of an empire. In this sense Julius Cæsar was called *emperor*: the same title descended with the dignity to Octavius, Augustus, Tiberius, and Caligula; and afterwards it became elective.

In strictness, the title *emperor* does not, and cannot, add any thing to the rights of sovereignty: its effect is only to give precedence and pre-eminence above other sovereigns; and as such, it raises those invested with it to the summit of all human greatness.

It is disputed, whether or not emperors have the power of disposing of the regal title. It is true, they have sometimes taken upon them to erect kingdoms; and thus it is that Bohemia and Poland are said to have been raised to the dignity: thus also, the emperor Charles the Bald, in the year 877, gave Provence to Boson, putting the diadem on his head, and decreeing him to be called "king," *ut more priscorum imperatorum regibus videretur dominari*. Add, that the emperor Leopold erected the ducal Prussia into a kingdom in favour of the elector of Brandenburg; and though several of the kings of Europe refused for some time to acknowledge him in that capacity, yet by the treaty of Utrecht in 1712 they all came in.

In the East, the title and quality of emperor are more frequent than they are among us; thus, the sovereign princes of China, Japan, Mogul, Persia, &c. are all emperors of China, Japan, &c. In the year 1723, the czar of Muscovy assumed the title of *emperor of all Russia*, and procured himself to be recognized as such by most of the princes and states of Europe.

In the West, the title has been a long time restrained to the emperors of Germany. The first who bore it was Charlemagne, who had the title of emperor conferred on him by Pope Leo III. though he had all the power before. The imperial prerogatives were formerly much more extensive than they are at present. At the close of the Saxon race, A. D. 1024, they exercised the right of conferring all the ecclesiastical benefices in Germany; of receiving the revenues of them during a vacancy; of succeeding to the effects of intestate ecclesiastics; of confirming or annulling the elections of the popes; of assembling councils, and of appointing them to decide concerning the affairs of the church; of conferring the title of king on their vassals; of granting vacant fiefs; of receiving the revenues of the empire; of governing Italy as its proper sovereigns; of erecting free cities, and establishing fairs in them; of assembling the diets of the empire, and fixing the time of their duration; of coining money, and conferring the same privilege on the states of the empire; and of administering both high and low justice within the territories of the different states: but in the year 1437, they were reduced to the right of conferring all dignities and titles, except the privilege of being a state of the empire; of *preces primaria*, or of appointing once during their reign a dignitary in each chapter or religious house; of granting dispensations with respect to the age of majority; of erecting cities, and conferring the privilege of coining money; of calling the meetings of the diet, and presiding in them.

To which some have added, 1. That all the princes and states of Germany are obliged to do them homage, and swear fidelity to them. 2. That they, or their generals, have a right to command the forces of all the princes of the empire, when united together. 3. That they receive a kind of tribute from all the princes and states of the empire, for carrying on a war which concerns the whole empire, which is called the *Roman month*. For the rest, there is not a foot of land or territory annexed to his title: but ever since the reign of Charles IV. the emperors have depended entirely on their hereditary dominions as the only source of their power, and even of their subsistence. See DIET and ELECTORS.

The kings of France were anciently also called emperors, at the time when they reigned with their sons, whom they associated to the crown. Thus Hugh Capet, having associated his son Robert, took the title of emperor, and Robert that of king; under which titles they are mentioned in the History of the Council of Rheims, by Gerbert, &c. King Robert is also called emperor of the French by Helgau of Fleury. Louis le Gros, upon associating his son, did the same. In the First Register of the King's Charters, fol. 166, are found letters of Louis le Gros, dated in 1116, in favour of Raymond bishop of Maguelonne, wherein he styles himself, *Ludovicus, Dei ordinante providentia*,
Fran.

Empetrum
||
Empire.

Francorum imperator augustus. The kings of England had likewise anciently the title of emperors, as appears from a charter of king Edgar: *Ego Edgarus Anglorum basileus, omniumque regum insularum oceani quæ Britanniam circumjacent, &c. imperator & dominus.*

EMPETRUM, BERRY-BEARING HEATH: A genus of the triandria order, belonging to the monœcia class of plants. In the natural method this genus is ranked by Linnæus under the 54th order, *Miscellanea*; and likewise among those of which the order is doubtful. The male calyx is tripartite; the corolla tripetalous; the stamina long; the female calyx is tripartite; the corolla tripetalous; the styles nine; the berry nine-seeded. There are two species; one of which, viz. the nigrum, which bears the crow-crake berries, is a native of Britain. It grows wild on boggy heaths and mountains. Children sometimes eat the berries; but, when taken in too great quantity, they are apt to occasion a headach. Grouse feed upon them. When boiled with alum, they afford a dark purple dye. Goats are not fond of it. Cows, sheep, and horses refuse it.

EMPHASIS, in rhetoric, a particular stress of the voice and action, laid on such parts or words of the oration as the orator wants to inforce upon his audience. See DECLAMATION; ORATORY, Part IV.; and READING.

EMPHYSEMA, in surgery, a windy tumor, generally occasioned by a fracture of the ribs, and formed by the air insinuating itself, by a small wound, between the skin and muscles, into the substance of the cellular or adipose membrane, spreading itself afterwards up to the neck, head, belly, and other parts, much after the manner in which butchers blow up their veal.

EMPIRE (*imperium*), in political geography, a large extent of land, under the jurisdiction or government of an emperor. See EMPEROR.

In ancient history we read of four great monarchies or empires, viz. that of the Babylonians, Chaldeans, and Assyrians; that of the Medes and Persians; that of the Greeks; and that of the Romans. The first subsisted from the time of Nimrod, who founded it in the year of the world 1800, according to the computation of Usher, to Sardanapalus their last king in 3257, and consequently lasted above 1450 years. The empire of the Medes commenced under Arbace, in the year of the world 3257, and was united to that of the Babylonians and Persians under Cyrus, in the 3468, and it closed with the death of Darius Codomannus in 3674. The Grecian empire lasted only during the reign of Alexander the Great, beginning in the year of the world 3674, and terminating with the death of this conqueror in 3681, his conquests being divided among his captains. The Roman empire commenced with Julius Cæsar, when he was made perpetual dictator, in the year of the city 708, and of the world 3956, 48 years after Christ. The seat of the empire was removed to Byzantium by Constantine, in the year of our Lord 334; the east and west were then united under the title of the Roman empire, till the Romans proclaimed Charlemagne emperor, A. D. 800. From this epocha the east and west formed two separate empires; that of the east, governed by Greek emperors, commenced A. D. 802: and being gradually weakened, terminated under

Constantine Palæologus in 1453. The western empire was afterwards known by the appellation of the empire or German empire.

Antiquaries distinguish between the medals of the upper, and lower or bas, empire.—The curious only value those of the upper empire, which commences with Cæsar or Augustus, and ends in the year of Christ 260. The lower empire comprehends near 1200 years, reckoning down to the destruction of Constantinople in 1453.—They usually distinguish two ages, or periods, of the lower empire: the first beginning where the upper ends, viz. with Aurelian, and ending with Anastasius, including 200 years; the second beginning with Anastasius, and ending with the Palæologi, which includes 1000 years.

EMPIRE, or *The empire*, used absolutely and without any addition, signifies the empire of Germany; called also, in juridical acts and laws, The holy Roman empire. It had its beginning with the ninth century; Charlemagne being created first emperor by Pope Leo III. who put the crown on his head in St Peter's church on Christmas-day in the year 800.

Authors are at a loss under what form of government to range the empire. Some of them maintain it to be a monarchical state, because all the members thereof are obliged to ask the investiture of their states of the emperor, and to take an oath of fidelity to him. Others consider it as a republic, or aristocratic state, because the emperor cannot resolve or determine any thing without the concurring suffrages of the princes. It is added, that if they require investiture from, and swear fealty to him, it is only as head of the republic, and in the name of the republic, and not in his own; just as at Venice every thing is transacted in name of the doge. Others will have the empire to be a monarcho-aristocratic state, i. e. a mixture of monarchy and aristocracy; because, though the emperor in many cases seems to act sovereignly, yet his decrees and resolves have no force, in case the state refuse to confirm them. Lastly, it has been called an aristo-democratic state, because the diet, wherein the sovereignty is lodged, is composed of princes and the deputies of the cities; and is divided into three orders or bodies, called *colleges*, viz. the college of electors, the college of princes, and the college of cities.

We say, diet of the empire, circles of the empire, fiefs of the empire, princes of the empire, estates of the empire, members of the empire, capitulations of the empire. See DIET, CIRCLE, PRINCE, CAPITULATION, &c.

The states or estates of the empire are of two kinds, mediate and immediate. The immediate states are those who hold immediately of the empire: Whereof, again, there are two kinds; the first, such as have seats and voices in the imperial diet; the second, such as have none. The mediate states are those who hold of the immediate.

The states which now compose the empire are, The princes of the empire, the counts of the empire, the free barons of the empire, the prelates of the empire, the princesses or abbesses of the empire, the nobles of the empire, and the imperial cities.

EMPIRIC, an appellation given to those physicians who conduct themselves wholly by their own experience, without studying physic in a regular way.

Some

Empire,
Empiric.

Empis
||
Emulgent.

Some even use the term, in a still worse sense, for a quack who prescribes at random, without being at all acquainted with the principles of the art.

EMPIS, in zoology, a genus of insects belonging to the order Diptera; of which the characters are these: The proboscis is of an horny substance, bivalve, reflexed under the head and breast, and longer than the thorax. See a specimen on Plate CLXXXII.

EMPLASTER. See PLASTER.

EMPORIÆ, a double city of the Hither Spain, near the Pyrenees; separated by a wall; one part occupied by the Greeks of Phocæa, whence originally are the Massilienses; the other, by native Spaniards, to whom was added by Augustus a Roman colony. Now Ampurias, in Catalonia. E. Long. 2. 50. N. Lat. 42. 15.

EMPORIUM, in medicine, is often used for the common sensory in the brain. See BRAIN.

EMPORIUM, (anc. geog.), two cities near Placentia; one well fortified, and guarded by a strong garrison, at which Hannibal met a repulse: the other, Hannibal took and plundered. Now thought to be Ponte Nura, in the duchy of Placentia.

EMPRESS, the spouse of an emperor, or a woman who governs an empire. See EMPEROR.

EMPROSTHOTONOS, a species of convulsion, wherein the head bends forward.

EMPYÆMA, in medicine, a disorder wherein purulent matter is contained in the thorax or breast, after an inflammation and suppuration of the lungs and pleura. See MEDICINE-Index.

EMPYREAL AIR. So Dr Higgens denominates that which Dr Priestley calls *dephlogisticated* air, and other philosophers *vital* or *pure* air.

EMPYREUM, a term used by divines for the highest heaven, where the blessed enjoy the beatific vision. The word is formed of *εἰς* and *πῦρ* fire, because of its splendor.

EMPYREUMA, in chemistry, signifies a very disagreeable smell produced from burnt oils. It is often perceived in distillations of animal as well as vegetable substances when they are exposed to a quick fire.

EMRODS. See HEMORRHOIDS.

EMULATION, a generous ardor kindled by the praise-worthy examples of others, which impels us to imitate, to rival, and, if possible, to excel them. This passion involves in it esteem of the person whose attainments or conduct we emulate, of the qualities and actions in which we emulate him, and a desire of resemblance, together with a joy springing from the hope of success. The word comes originally from the Greek *ἐμιλλα*, *dispute, contest*; whence the Latin, *emulus*, and thence our *emulation*.

Plato observes of emulation, that it is the daughter of envy; if so, there is a great difference between the mother and the offspring; the one is a virtue and the other a vice. Emulation admires great actions, and strives to imitate them; envy refuses them the praises that are their due; emulation is generous, and only thinks of surpassing a rival; envy is low, and only seeks to lessen him. Perhaps, therefore, it would be more just to suppose emulation the daughter of admiration: admiration, however, is a principal ingredient in the composition of it.

EMULGENT, or RENAL, ARTERIES, those which

supply the kidneys with blood; being sometimes single, sometimes double, on each side. See ANATOMY, n° 23.

EMULSION, a soft liquid remedy, of a colour and consistence resembling milk. See PHARMACY.

EMUNCTORY, in anatomy, a general term for all those parts which serve to carry off the excrementitious parts of the blood and other humours of the body. Such more especially are the kidneys, bladder, and most of the glands.

ENALLAGE, in grammar, is when one word is substituted for another of the same part of speech: A substantive for an adjective; as *exercitus victor*, for *victoriosus*; *scelus*, for *sceleratus*: A primitive for a derivative; as *Dardana arma*, for *Dardania*: An active for a passive; as *nox humida celo precipitat*, for *precipitatur*, &c.

ENAMEL, in general, is a vitrified matter betwixt the parts of which is dispersed some unvitrified matter: hence enamel ought to have all the properties of glass except transparency.

Enamels have for their basis a pure crystal glass or frit, ground up with a fine calx of lead and tin prepared for the purpose, with the addition usually of white salt of tartar. These ingredients baked together are the matter of all enamels, which are made by adding colours of this or that kind in powder to this matter, and melting or incorporating them together in a furnace.

For white enamel, Neri (*De Arte Vitriar.*) directs only manganese to be added to the matter which constitutes the basis. For azure, zaffer mixed with calx of brass. For green, calx of brass with scales of iron, or with crocus martis. For black, zaffer with manganese or with crocus martis; or manganese with tartar. For red, manganese, or calx of copper and red tartar. For purple, manganese with calx of brass. For yellow, tartar and manganese. And for violet-coloured enamel, manganese with thrice-calcined brass.

In making these enamels, the following general cautions are necessary to be observed. 1. That the pots must be glazed with white glass, and must be such as will bear the fire. 2. That the matter of enamels must be very nicely mixed with the colours. 3. When the enamel is good, and the colour well incorporated, it must be taken from the fire with a pair of tongs. 4. The general way of making the coloured enamel is this: Powder, sift, and grind, all the colours very nicely, and first mix them with one another, and then with the common matter of enamels: then set them in pots in a furnace; and when they are well mixed and incorporated, cast them into water; and when dry, set them in a furnace again to melt; and when melted, take a proof of it. If too deep-coloured, add more of the common matter of enamels; and if too pale, add more of the colours.

Enamels are used either in counterfeiting or imitating precious stones, in painting in enamel; or by enamellers, jewellers, and goldsmiths, in gold, silver, and other metals. The two first kinds are usually prepared by the workmen themselves, who are employed in these arts. That used by jewellers, &c. is brought to us chiefly from Venice or Holland, in little cakes of different sizes, commonly about four inches diameter, having the mark of the maker stuck upon it with a punchon. It pays 1 s. 7⁴/₁₀ d. the pound on importation,

Emulsion
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Enamel.

Enamel-
ling.

tation, and draws back 1 s. 5¹⁰/₁₀₀ d. at the rate of 4 s. per pound.

ENAMELLING, the art of laying enamel upon metals, as gold, silver, copper, &c. and of melting it at the fire, or of making divers curious works in it at a lamp. It signifies also to paint in enamel.

The method of painting in ENAMEL. This is performed on plates of gold or silver, and most commonly of copper, enamelled with the white enamel; whereon they paint with colours which are melted in the fire, where they take a brightness and lustre like that of glass. This painting is the most prized of all for its peculiar brightness and vivacity, which is very permanent, the force of its colours not being effaced or sullied with time as in other painting, and continuing always as fresh as when it came out of the workmen's hands. It is usual in miniature; it being the more difficult the larger it is, by reason of certain accidents it is liable to in the operation. Enamelling should only be practised on plates of gold, the other metals being less pure: copper, for instance, scales with the application, and yields fumes; and silver turns the yellow white. Nor must the plate be made flat; for in such case, the enamel cracks; to avoid which, they usually forge them a little round or oval, and not too thick. The plate being well and evenly forged, they usually begin the operation by laying on a couch of white enamel (as we observed above) on both sides, which prevents the metal from swelling and blistering; and this first layer serves for the ground of all the other colours. The plate being thus prepared, they begin at first by drawing out exactly the subject to be painted with red vitriol, mixed with oil of spike, marking all parts of the design very lightly with a small pencil. After this, the colours (which are to be before ground with water in a mortar of agate extremely fine, and mixed with oil of spike somewhat thick) are to be laid on, observing the mixtures and colours that agree to the different parts of the subject; for which it is necessary to understand painting in miniature. But here the workman must be very cautious of the good or bad qualities of the oil of spike he employs to mix his colours with, for it is very subject to adulterations.

Great care must likewise be taken, that the least dust imaginable come not to your colours while you are either painting or grinding them; for the least speck, when it is worked up with it, and when the work comes to be put into the reverberatory to be red hot, will leave a hole, and so deface the work.

When the colours are all laid, the painting must be gently dried over a slow fire to evaporate the oil, and the colours afterwards melted to incorporate them with the enamel, making the plate red-hot in a fire like what the enamellers use. Afterwards that part of the painting must be passed over again which the fire hath any thing effaced, strengthening the shades and colours, and committing it again to the fire, observing the same method as before, which is to be repeated till the work be finished.

Method of ENAMELLING by the Lamp. Most enamelled works are wrought at the fire of a lamp, in which, instead of oil, they put melted horse-grease, which they call *caballine oil*. The lamp, which is of copper, or white iron, consists of two pieces; in one of which is a kind of oval plate, six inches long, and two high,

in which they put the oil and the cotton. The other Enamelling part, called the *box*, in which the lamp is inclosed, serves only to receive the oil which boils over by the force of the fire. This lamp, or, where several artists work together, two or three more lamps are placed on a table of proper height. Under the table, about the middle of its height, is a double pair of organ-bellows, which one of the workmen moves up and down with his foot to quicken the flame of the lamps, which are by this means excited to an incredible degree of vehemence. Grooves made with a gauge in the upper part of the table, and covered with parchment, convey the wind of the bellows to a pipe of glass before each lamp; and that the enamellers may not be incommoded with the heat of the lamp, every pipe is covered at six inches distance with a little tin plate, fixed into the table by a wooden handle. When the works do not require a long blast, they only use a glass-pipe, into which they blow with their mouth.

It is incredible to what a degree of fineness and delicacy the threads of enamel may be drawn at the lamp. Those which are used in making false tufts of feathers are so fine, that they may be wound on the reel like silk or thread. The fictitious jets of all colours, used in embroideries, are also made of enamel; and that with so much art, that every small piece hath its hole to pass the thread through wherewith it is sewed. These holes are made by blowing them into long pieces; which they afterwards cut with a proper tool.

It is seldom that the Venetian or Dutch enamels are used alone: they commonly melt them in an iron-ladle, with an equal part of glass or crystal; and when the two matters are in perfect fusion, they draw it out into threads of different sizes, according to the nature of the work. They take it out of the ladle while liquid, with two pieces of broken tobacco-pipes, which they extend from each other at arm's length. If the thread is required still longer, then another workman holds one end, and continues to draw it out, while the first holds the enamel to the flame. Those threads, when cold, are cut into what lengths the workman thinks fit, but commonly from 10 to 12 inches; and as they are all round, if they are required to be flat, they must be drawn through a pair of pinchers while yet hot. They have also another iron instrument in form of pinchers, to draw out the enamel by the lamp when it is to be worked and disposed in figures. Lastly, they have glass-tubes of various sizes, serving to blow the enamel into various figures, and preserve the necessary vacancies therein; as also to spare the stuff, and form the contours. When the enameller is at work, he sits before the lamp with his foot on the step that moves on the bellows; and holding in his left hand the work to be enamelled, or the brass or iron-wires the figures are to be formed on, he directs with his right the enamel thread, which he holds to the flame with a management and patience equally surprising. There are few things they cannot make or represent with enamel; and some figures are as well finished, as if done by the most skillful carvers.

ENARTHROSIS, in anatomy, a species of DIARTHROSIS.

ENCÆNIA, the name of three several feasts celebrated by the Jews in memory of the dedication, or rather

Enamelling
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Encænia

Encamp-
ment
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Encaustic.

rather purification, of the temple, by Judas Maccabæus, Solomon, and Zorobabel. This term is likewise used in church-history for the dedication of Christian churches.

ENCAMPMENT, the pitching of a CAMP.

ENCANTHIS, in surgery, a tubercle arising either from the caruncula lachrymalis, or from the adjacent red skin; sometimes so large, as to obstruct not only the puncta lachrymalia, but also part of the sight or pupil itself. See SURGERY.

ENCAUSTIC and ENCAUSTUM, the same with enamelling and enamel. See ENAMELLING and ENAMEL.

ENCAUSTIC Painting, a method of painting made use of by the ancients, in which wax was employed to give a gloss to their colours, and to preserve them from the injuries of the air.

This ancient art, after having been long lost, was restored by Count Caylus, a member of the Academy of Inscriptions in France; and the method of painting in wax was announced to the Academy of Painting and Belles Lettres in the year 1753; though M. Bachelier, the author of a treatise *De l'Histoire & du Secret de la Peinture en Cire*, had actually painted a picture in wax in 1749; and he was the first who communicated to the public the method of performing the operation of inustion, which is the principal characteristic of the encaustic painting. The Count kept his method a secret for some time, contenting himself with exhibiting a picture at the Louvre in 1754, representing the head of Minerva, painted in the manner of the ancients, which excited the curiosity of the public, and was very much admired. In the interval of suspense, several attempts were made to recover the ancient method of painting. The first scheme adopted was that of melting wax and oil of turpentine together, and using this composition as a vehicle for mixing and laying on the colours. But this method did not explain Pliny's meaning, as the wax is not burnt in this way of managing it. In another attempt, which was much more agreeable to the historian's description of encaustic painting, the wax was melted with strong lixivium of salt of tartar, and with this the colours were ground. When the picture was finished, it was gradually presented to the fire, so as to melt the wax; which was thus diffused through all the particles of the colours, so that they were fixed to the ground, and secured from the access of air or moisture. But the method of count Caylus is much more simple: the cloth or wood, which he designed for the basis of his picture, is waxed over, by only rubbing it simply with a piece of bees-wax; the wood or cloth, stretched on a frame, being held horizontally over, or perpendicularly before a fire, at such a distance, that the wax might gradually melt, whilst it is rubbed on, diffuse itself, penetrate the body, and fill the interstices of the texture of the cloth, which, when cool, is fit to paint upon; but as water colours, or those that are mixed up with common water, will not adhere to the wax, the whole picture is to be first rubbed over with Spanish chalk or white, and then the colours are applied to it; when the picture is dry, it is put near the fire, whereby the wax melts, and absorbs all the colours.

Mr J. H. Muntz, in a treatise on this subject, has
N^o 115.

proposed several improvements in the art of encaustic painting. When the painting is on cloth, he directs it to be prepared by stretching it on a frame, and rubbing one side several times over with a piece of bees-wax, or virgin wax, till it is covered with a coat of wax of considerable thickness. In fine linen, this is the only operation necessary previous to painting; but coarse cloth must be rubbed gently on the unwaxed side with a pumice stone, to take off all those knots which would prevent the free and accurate working of the pencil. Then the subject is to be painted on the unwaxed side with colours prepared and tempered with water; and when the picture is finished, it must be brought near the fire, that the wax may melt and fix the colours. This method, however, can only be applied to cloth or paper, through the substance of which the wax may pass; but in wood, stone, metals, or plaster, the former method of Count Caylus must be observed.

Mr Muntz has also discovered a method of forming grounds for painting with crayons, and fixing these, as well as water-colours, employed with the pencil. On the unwaxed side of a linen cloth, stretched and waxed as before, lay an even and thick coat of the colour proper for the ground; having prepared this colour by mixing some proper pigment with an equal quantity of chalk, and tempering them with water. When the colour is dry, bring the picture to the fire that the wax may melt, pass through the cloth, and fix the ground. An additional quantity of wax may be applied to the back of the picture, if that which was first rubbed on should not be sufficient for the body of colour; but as this must be laid on without heat, the wax should be dissolved in oil of turpentine, and applied with a brush, and the canvas be again exposed to the fire, that the fresh supply of wax may pass through the cloth, and be absorbed by the colour; and thus a firm and good body will be formed for working on with the crayons. If cloth and paper are joined together, the cloth must be first fixed to the straining frame, and then the paper must be pasted to it with a composition of paste made with wheaten flour, or starch and water, and about a twelfth part of its weight of common turpentine. The turpentine must be added to the paste when it is almost sufficiently boiled, and the composition well stirred, and left to simmer over the fire for five or six minutes; let wax be dissolved in oil of turpentine to the consistence of a thin paste; and when the cloth and paper are dry, let them be held near a fire; and with a brush lay a coat of the wax and turpentine on both sides the joined cloth and paper, in such a degree of thickness, that both surfaces may shine throughout without any appearance of dull spots. Then expose the cloth to the fire or to the sun; by which means the oil will evaporate, and the wax become solid, and be fit to receive any composition of colour for a ground, which is to be laid on as above directed in the case of cloth without paper.

Almost all the colours that are used in oil-painting may be also applied in the encaustic method. Mr Muntz objects, indeed, to brown, light pink, and unburnt *terra di Sienna*; because these, on account of their gummy or stony texture, will not admit such a cohesion with the wax as will properly fix them; but

other

Encaustic

other colours which cannot be admitted in oil-painting, as red lead, red orpiment, crystals of verdgris, and red precipitate of mercury, may be used here. The crayons used in encaustic painting are the same with those used in the common way of crayon painting, excepting those that in their composition are too tenacious; and the method of using them is the same in both cases.

The encaustic painting has many peculiar advantages: though the colours have not the natural varnish or shining which they acquire with oil, they have all the strength of paintings in oil, and all the airiness of water-colours, without partaking of the apparent character or defects of either; they may be looked at in any light and in any situation, without any false glare: the colours are firm, and will bear washing; and a picture, after having been smoaked, and then exposed to the dew, becomes as clean as if it had been but just painted. It may also be retouched at pleasure without any detriment to the colours; for the new colours will unite with the old ones, without spots, as is the case in common size painting; nor is it necessary to rub the places to be retouched with oil as in oil pictures; it is not liable to crack, and easily repaired, if it should chance to suffer any injury. The duration of this painting is also a very material advantage; the colours are not liable to fade and change; no damp can affect them, nor any corrosive substance injure them; nor can the colour fall off in shivers from the canvas. However, notwithstanding all these and other advantages enumerated by the abbe Mazeas and Mr Muntz, this art has not yet been much practised. Many of these properties belong to a much higher species of encaustic painting afterwards discovered in England, the colours of which are fixed by a very intense heat; nor are the colours or grounds on which they are laid liable to be dissolved or corroded by any chemical menstruum, nor, like the glassy colours of enamel, to run out of the drawing on the fire. What this method consists in will appear from the following account communicated in a letter from Mr Josiah Colebrooke to the earl of Macclesfield president of the Royal Society in 1759.

"The art of painting with burnt wax (says he) has long been lost to the world. The use of it to painters in the infancy of the art of painting, was of the utmost consequence. Drying oil being unknown, they had nothing to preserve their colours entire from the injury of damps and the heat of the sun: a varnish of some sort was therefore necessary; but they being unacquainted with distilled spirits, could not, as we now do, dissolve gums to make a transparent coat for their pictures: this invention therefore of burnt wax supplied that defect to them; and with this manner of painting, the chambers and other rooms in their houses were furnished: this Pliny calls *encaustum*, and we *encaustic painting*.

"The following experiments which I have the honour to lay before your Lordship and the Society, were occasioned by the extract of a letter from the abbe Mazeas, translated by Dr Parsons, and published in the second part of the XLIXth volume of the Philosophical Transactions, n^o 100. concerning the ancient method of painting with burnt wax, revived by count Caylus.

"The count's method was, 1. To rub the cloth or board designed for the picture simply over with bees-wax. 2. To lay on the colours mixed with common water; but as the colours will not adhere to the wax, the whole picture was first rubbed over with (A) Spanish chalk, and then the colours are used. 3. When the picture is dry, it is put near the fire, whereby the wax melts, and absorbs all the colours.

"Exp. I. A piece of oak-board was rubbed over with bees-wax, first against the grain of the wood, and then with the grain, to fill up all the pores that remained after it had been planed, and afterwards was rubbed over with as much dry Spanish white as could be made to stick on it. This, on being painted (the colours mixed with water only), so clogged the pencil, and mixed so unequally with the ground, that it was impossible to make even an outline, but what was so much thicker in one part than another, that it would not bear so much as the name of painting; neither had it any appearance of a picture. However, to pursue the experiment, this was put at a distance from the fire, on the hearth, and the wax melted by slow degrees: but the Spanish white (though laid as smooth as so soft a body would admit, before the colour was laid on), on melting the wax into it, was not sufficient to hide the grain of the wood, nor show the colours by a proper whiteness of the ground; the wax, in rubbing on the board, was unavoidably thicker in some parts than in others, and the Spanish white the same: on this I suspected there must be some mistake in the Spanish white, and made the inquiry mentioned (in the note A).

"To obviate the inequality of the ground in the first experiment;

"Exp. 2. A piece of old wainscot (oak board) $\frac{1}{4}$ th of an inch thick; which, having been part of an old drawer, was not likely to shrink on being brought near the fire: this was smoothed with a fish-skin, made quite warm before the fire; and then, with a brush dipped in white wax, melted in an earthen pipkin, smeared all over, and applied to the fire again, that the wax might be equally thick on all parts of the board, a ground was laid (on the waxed board), with levigated chalk mixed with gum-water, (*viz.* gum Arabic dissolved in water): when it was dry, I painted it with a kind of landscape; and pursuing the method laid down by count Caylus, brought it gradually to the fire. I fixed the picture on a fire-screen, which would preserve the heat, and communicate it to the back part of the board. This was placed first at the distance of three feet from the fire, and brought forwards by slow degrees, till it came

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within

(A) "Spanish chalk is called by Dr Parsons, in a note, *Spanish white*. This is a better kind of whitening than the common, and was the only white that had the name of *Spanish* annexed to it that I could procure, though I inquired for it at most if not all the colour-shops in town.

"My friend M. da Costa showed me a piece of Spanish chalk in his collection, which seemed more like a CIMOLIA (tobacco-pipe clay), and was the reason of my using that in one of the experiments.

Encaustic. within one foot of the fire, which made the wax swell and bloat up the picture; but as the chalk did not absorb the wax, the picture fell from the board and left it quite bare.

"Exp. 3. I mixed three parts white wax, and one part white resin, hoping the tenacity of the resin might preserve the picture. This was laid on a board heated with a brush, as in the former; and the ground was chalk, prepared as before. This was placed horizontally on an iron box, charged with an hot heater, shifting it from time to time, that the wax and resin might penetrate the chalk; and hoping from this position, that the ground, bloated by melting the wax, would subside into its proper place; but this, like the other, came from the board, and would not at all adhere.

"Exp. 4. Prepared chalk four drams, white wax, white resin, of each a dram, burnt alabaster half a dram, were all powdered together and sifted, mixed with spirit of molasses instead of water, and put for a ground on a board smeared with wax and resin, as in Exp. 3. This was also placed horizontally on a box-iron as the former: the picture blistered, and was cracked all over; and though removed from the box-iron to an oven moderately heated (in the same horizontal position), it would not subside, nor become smooth. When it was cold, I took an iron spatula made warm, and moved it gently over the surface of the picture, as if I were to spread a plaster. (This thought occurred, from the board being prepared with wax and resin, and the ground having the same materials in its composition, the force of the spatula might make them unite). This succeeded so well, as to reduce the surface to a tolerable degree of smoothness; but as the ground was broke off in many places, I repaired it with flake white, mixed up with the yolk of an egg and milk, and repainted it with molasses spirit (instead of water), and then put it into an oven with a moderate degree of heat. In this I found the colours fixed, but darker than when it was at first painted: and it would bear being washed with water, not rubbed with a wet cloth.

"Exp. 5. A board (that had been used in a former experiment) was smeared with wax and resin, of each equal parts; was wetted with molasses spirit, to make whitening (or Spanish white) mixed with gum-water adhere. This, when dry, was scraped with a knife, to make it equally thick in all places. It was put into a warm oven, to make the varnish incorporate partly with the whitening before it was painted; and it had only a small degree of heat: water only was used to mix the colours. This was again put into an oven with a greater degree of heat; but it flaked off from the board: whether it might be owing to the board's having had a second coat of varnish (the first having been scraped and melted off), and that the unctuous parts of the wax had so entered its pores, that it would not retain a second varnish, I cannot tell.

"Exp. 6. Having miscarried in these trials, I took a new board, planed smooth, but not polished either with a fish-skin or rushes: I warmed it, and smeared it with wax only; then took *cimolia* (tobacco-pipe clay) divested of its sand, by being dissolved in water and

poured off, leaving the coarse heavy parts behind. After this was dried and powdered, I mixed it with a small quantity of the yolk of an egg and cow's milk, and made a ground with this on the waxed board: this I was induced to try, by knowing that the yolk of an egg will dissolve almost all unctuous substances, and make them incorporate with water; and I apprehended, that a ground, thus prepared, would adhere so much the more firmly to the board than the former had done, as to prevent its flaking off. The milk, I thought, might answer two purposes; first, by uniting the ground with the wax; and secondly, by answering the end of size or gum-water, and prevent the colours from sinking too deep into the ground, or running one into another. When the ground was near dry, I smoothed it with a pallet-knife, and washed with milk and egg where I had occasion to make it smooth and even: when dry I painted it, mixing the colours with common water; this, on being placed horizontally in an oven only warm enough to melt the wax, flaked from the board; but held so much better together than any of the former, that I pasted part of it on paper.

"Exp. 7. Flake-white (or the purest sort of white-lead) mixed with egg and milk, crumbled to pieces in the oven, put on the waxed board, as in the last experiment.

"The bad success which had attended all the former experiments, led me to consider of what use the wax was in this kind of painting: and it occurred to me, that it was only as a varnish to preserve the colours from fading.

"In order to try this:

"Exp. 8. I took what the brick-layers call *fine stuff*, or *putty* (B): to this I added a small quantity of burnt alabaster, to make it dry: this it soon did in the open air; but before I put on any colours, I dried it gently by the fire, lest the colours should run. When it was painted, I warmed it gradually by the fire (to prevent the ground from cracking) till it was very hot. I then took white wax three parts, white resin one part, melted them in an earthen pipkin, and with a brush spread them all over the painted board, and kept it close to the fire in a perpendicular situation, that what wax and resin the plaster would not absorb might drop off. When it was cold, I found the colours were not altered, either from the heat of the fire, or passing the brush over them. I then rubbed it with a soft linen cloth, and thereby procured a kind of gloss, which I afterwards increased by rubbing it with an hard brush; which was so far from scratching or leaving any marks on the picture, that it became more smooth and polished by it.

"After I had made all the foregoing experiments, in conversation with my honoured and learned friend Dr Kidby, a fellow of this society, I said I had been trying to find out what the encaustic painting of the ancients was. Upon which he told me, that there was a passage in Vitruvius *de Architectura*, relative to that kind of painting; and was so good as to transcribe it for me from the 7th book, chap. 9. *De minii temperatura.* Vitruvius's words are: *At si quis subtilior fuerit, & voluerit expolitionem miniacem suum colorem retinere,*

(B) Putty is lime flaked, and, while warm, dissolved in water, and strained through a sieve.

*Encaustic. retinere, cum paries expositus & aridus fuerit, tunc ceram Punicam liquefactam igni, paulo oleo temperatam, seta inducat, deinde postea carbonibus in ferreo vase compositis, eam ceram apprimere cum pariete, calefaciendo sudore cogat, fiatque ut peræquetur, deinde cum candela linteisque puris subigat, uti signa marmorea nuda curantur. Hæc autem *καυσίς* Græce dicitur. Ita obflans cera Punice lorica non patitur, nec lunæ splendorem, nec solis radios lambendo eripere ex his positionibus colorem.*

"Which I thus translate: 'But if any one is more wary, and would have the polishing [painting] with vermilion hold its colour, when the wall is painted and dry, let him take Carthaginian [Barbary] wax, melted with a little oil, and rub it on the wall with an hair-pencil; and afterwards let him put live coals into an iron vessel [chaffing-dish], and hold it close to the wax, when the wall, by being heated, begins to sweat; then let it be made smooth: afterwards let him rub it with a (c) candle and (d) clean linen rags, in the same manner as they do the naked marble statues. This the Greeks call *καυσίς*. The coat of Carthaginian wax (thus put on) is so strong, that it neither suffers the moon by night, nor the sun-beams by day, to destroy the colour.'

"Being satisfied, from this passage in Vitruvius, that the manner of using wax in Exp. 8. was right, I was now to find if the wax-varnish, thus burnt into the picture, would bear washing. But here I was a little disappointed; for rubbing one corner with a wet linen cloth, some of the colour came off; but washing it with a soft hair-pencil dipped in water, and letting it dry without wiping, the colour stood very well.

"A board painted, as in Exp. 8. was hung in the most smoky part of a chimney for a day, and exposed to the open air in a very foggy night. In the morning the board was seemingly wet through, and the water ran off the picture. This was suffered to dry without wiping; and the picture had not suffered at all from the smoke or the dew, either in the ground or the colours; but when dry, by rubbing it, first with a soft cloth, and afterwards with a brush, it recovered its former gloss.

"Suspecting that some tallow might have been mixed with the white wax I had used, which might cause the colours to come off on being rubbed with a wet cloth, I took yellow wax which had been melted from the honeycomb in a private family, and consequently not at all adulterated: to three parts of this I added one part resin, and melted them together.

"Exp. 9. Spanish-white, mixed with fish-glue, was put for a ground on a board, and painted with water-colours only. The board was made warm; and then the wax and resin were put on with a brush, and kept close to the fire till the picture had imbibed all the varnish, and looked dry. When it was cold, I rub-

bed it first with a linen cloth, and then polished it with an hard brush. *Encaustic.*

"In these experiments I found great difficulties with regard to colours. Many water-colours being made from the juices of plants, have some degree of an acid in them; and these, when painted on an alkaline ground, as chalk, whitening, *cimolia*, and plaster, are totally changed in their colours, and from green become brown; which contributes much to make the experiments tedious. I would therefore advise the use of mineral or metallic colours for this sort of painting, as most likely to preserve their colour: for although I neutralized Spanish white, by fermenting it with vinegar, and afterwards washed it very well with water, it did not succeed to my wish.

"These experiments, and this passage from Vitruvius, will in some measure explain the obscurity of part of that passage in Pliny which Dr Parsons, in his learned comment on the encaustic painting with wax, seems to despair of.

"*Ceris pingere*, was one species of encaustic painting. *Εγκαυσον, inustum*, may be translated, "forced in by the means of fire, burnt in:" for whatever is forced in by the help of fire can be rendered into Latin by no other significant word that I know of but *inustum*. If this is allowed me, and I think I have the authority of Vitruvius (a writer in the Augustine age) for it, who seems to have wrote from his own knowledge, and not like Pliny, who copied from others much more than he knew himself, the difficulty with regard to this kind of painting is solved, and the encaustic with burnt wax recovered to the public.

"What he means by the next kind he mentions, *in ebore cestro id est viriculo*, I will not attempt to explain at present.

"The ship-painting is more easily accounted for: the practice being in part continued to this time; and is what is corruptly called *breaming*, for brenning or burning.

"This is done by reeds set on fire, and held under the side of a ship till it is quite hot; then resin, tallow, tar, and brimstone, melted together, and put on with an hair brush while the planks remain hot, make such a kind of paint as Pliny describes: which, he says, *nec sole, nec fale, ventisque corrumpitur*. As they were ignorant of the use of oil-painting, they mixed that colour with the wax, &c. which they intended for each particular part of the ship, and put it on in the manner above described.

"In the pictures painted for these experiments, and now laid before your lordship and the society, I hope neither the design of the landscape, nor the execution of it, will be so much taken into consideration as the varnish (which was the thing wanted in this inquiry): and I think that will evince, that the encaustic paint-

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(c) The account of the method of polishing [painting] walls coloured with vermilion, gave me great satisfaction, as it proved the method I had taken in experiment 8. (which I had tried before I saw or knew of this passage in Vitruvius) was right. The use of the candle, as I apprehend, was to melt the wax on the walls where by accident the brush had put on too much, or afford wax where the brush had not put on enough, or had left any part bare.

(d) The rubbing the wall with a linen cloth, while warm, will do very well, where there is only one colour to be preserved; but where there are many, as in a landscape, it will be apt to take off some, or render the colouring rather faint; which I found by wiping the wax off from a painting while it was hot.

Encaustic.

ing with burnt wax is fully restored by these experiments; and though not a new invention, yet having been lost for so many ages, and now applied further, and to other purposes, than it was by Vitruvius (who confined it to vermilion only), may also amount to a new discovery, the use of which may be a means of preserving many curious drawings to posterity: for this kind of painting may be on paper, cloth, or any other substance that will admit a ground to be laid on it. The process is very simple, and is not attended with the disagreeable smell unavoidable in oil-painting, nor with some inconveniences inseparable from that art; and as there is no substance we know more durable than wax, it hath the greatest probability of being lasting."

Still, however, there seem to have been some defects or inconveniences attending these and other subsequent attempts: for we find the ancient or some similar method of painting in wax remaining a desideratum upwards of 25 years after the publication of the preceding experiments; when in 1787 a method was communicated to the Society of Arts by Miss Greenland, for which she was rewarded with a prize. The ground of her information she received at Florence, through the acquaintance of an amateur of painting, who procured her the satisfaction of seeing some paintings in the ancient Grecian style, executed by Signora Parenti, a professor at that place, who had been instructed by a Jesuit at Pavia, the person who made the farthest discoveries in that art. Miss Greenland's friend knowing she was fond of painting, informed her what were the materials the painters used, but could not tell her the proportions of the composition; however, from her anxiety to succeed in such an acquisition, she made various experiments, and at last obtained such a sufficient knowledge of the quantities of the different ingredients as to begin and finish a picture, which she afterwards presented to the Society for their inspection.

Her method is as follows: "Take an ounce of white wax, and the same weight of gum mastic powdered. Put the wax in a glazed earthen vessel over a very slow fire; and when it is quite dissolved, strew in the mastic, a little at a time, stirring the wax continually until the whole quantity of gum is perfectly melted and incorporated: then throw the paste into cold water; and when it is hard, take it out of the water, wipe it dry, and beat it in one of Mr Wedgwood's mortars, observing to pound it at first in a linen cloth to absorb some drops of water that will remain in the paste, and would prevent the possibility of reducing it to a powder, which must be so fine as to pass through a thick gauze. It should be pounded in a cold place and but a little while at a time, as after long beating the friction will in a degree soften the wax and gum, and instead of their becoming a powder they will return to a paste.

"Make some strong gum-arabic water; and when you paint, take a little of the powder, some colour, and mix them together with the gum-water. Light colours require but a small quantity of the powder, but more of it must be put in proportion to the body and darkness of the colours; and to black there should be almost as much of the powder as colour.

"Having mixed the colours, and no more than can be used before they grow dry, paint with fair water, as is practised in painting with water-colours, a ground on

the wood being first painted of some proper colour prepared in the same manner as is described for the picture; walnut-tree and oak are the sorts of wood commonly made use of in Italy for this purpose. The painting should be very highly finished; otherwise, when varnished, the tints will not appear united.

"When the painting is quite dry, with rather a hard brush, passing it one way, varnish it with white wax, which is put into an earthen vessel, and kept melted over a very slow fire till the picture is varnished, taking great care the wax does not boil. Afterwards hold the picture before a fire, near enough to melt the wax, but not make it run; and when the varnish is entirely cold and hard, rub it gently with a linen cloth. Should the varnish blister, warm the picture again very slowly, and the bubbles will subside. When the picture is dirty, it need only be washed with cold water."

The opinion given by the Society upon the above is: The method made use of by Miss Greenland provides against all inconveniences; and the brilliancy of the colours in the picture painted by her, and exhibited to the Society, fully justifies the opinion, that the art of painting in wax, as above described, highly merited the reward of a gold pallet voted to her on this occasion.

ENCEINTE, in fortification, is the wall or rampart which surrounds a place, sometimes composed of bastions or curtains, either faced or lined with brick or stone, or only made of earth. The enceinte is sometimes only flanked by round or square towers, which is called a *Roman wall*.

ENCEPHALI, in medicine, worms generated in the head, where they cause so great a pain as sometimes to occasion distraction.

The encephali are very rare; but there are some diseases wherein they swarm; from whence we are told pestilential fevers have wholly arisen. Upon the dissection of one who died of this fever, a little, short, red worm was found in the head, which malmsey wine, wherein horse-radish had been boiled, could alone destroy. This medicine was afterwards tried on the sick, most of whom it cured.

The like worms have also been taken out by trepanning, and the patient cured. Those worms that generate in the nose, ears, and teeth, are also called *encephali*.

ENCHANTER, a person supposed to practise enchantment or fascination. See FASCINATION, WITCHCRAFT, &c.

ENCHANTER's *Nightshade*, in botany. See CIRCÆA.

ENCHASING, INCHASING, or *Chasing*, the art of enriching and beautifying gold, silver, and other metal-work, by some design or figures represented thereon in low relieve.

Enchasing is practised only on hollow thin works, as watch-cases, cane-heads, tweezer-cases, or the like. It is performed by punching or driving out the metal, to form a figure, from within, so as to stand out prominent from the plane or surface of the metal. In order to this, they provide a number of fine steel blocks or puncheons of divers sizes; and the design being drawn on the surface of the metal, they apply the inside upon the heads or tops of these blocks, directly under the lines or parts of the figures; then, with a fine

Enceinte
||
Enchasing.

Enclitica
Endow-
ment.

fine hammer, striking on the metal, sustained by the block, the metal yields, and the block makes an indenture or cavity on the inside, corresponding to which there is a prominence on the outside, which is to stand for that part of the figure.

Thus the workman proceeds to chase and finish all the parts by the successive application of the block and hammer to the several parts of the design. And it is wonderful to consider with what beauty and justness, by this simple piece of mechanism, the artists in this kind will represent foliages, grotesques, animals, histories, &c.

ENCLITICA, in grammar, particles which are so closely united with other words as to seem part of them, as in *virumque*, &c.—There are three enclitic particles in Latin. viz. *que, ne, ve*.

ENCRATITES, in church-history, heretics who appeared towards the end of the second century: they were called *Encratites*, or *Continentes*, because they gloried in abstaining from marriage and the use of wine and animal-food.

ENCURECK, in natural history, a venomous insect found in Persia, and said to be a kind of tarantula. According to Olearius as quoted by Mr Boyle, it neither stings nor bites; but lets fall its venom like a drop of water, which causes insufferable pain in the part for a time, and afterwards so profound a sleep, that nothing can awake the patient except crushing one of the creatures on the part affected. It is nevertheless said, that the sheep eat these insects without damage.

ENCYCLOPÆDIA, a term nearly synonymous with CYCLOPÆDIA; but adopted in preference to it in denominating the present work, as being more definite and of better authority. According to an observation of the late learned printer Mr Bower, the preposition *EN* makes the meaning of the word more precise: For *Cyclopædia* may denote "the instruction of a circle," as *Cyropædia* is "the instruction of Cyrus," whereas in *Encyclopædia* the preposition determines the word to be from the dative of *cyclus*, "instruction in a circle." And Vossius in his book *De vitiiis sermonis*, has observed, "That *Cyclopædia* is used by some authors, but *Encyclopædia* by the best."

ENDEMIC, or ENDEMICAL, DISEASES, those to which the inhabitants of particular countries are subject more than others, on account of the air, water, situation, and manner of living.

ENDIVE, in botany. See CICHORIUM.

ENDLESS, something without an end: thus authors mention endless rolls, the endless screw, &c.

ENDOR, (anc. geog.), a town of Galilee, four miles to the south of mount Tabor; in the tribe of Manasseh, where the Pythonefs was consulted by Saul: at this day, says Jerome, a large village.

ENDORSE, in heraldry, an ordinary, containing the eighth part of a pale, which Leigh says is only used when a pale is between two of them.

ENDORSED, in heraldry, is said of things borne back to back, more usually called *ADOSSE*.

ENDORSEMENT, in law and commerce. See INDORSEMENT.

ENDOWMENT, in law, denotes the settling a dower on a woman: though sometimes it is used figuratively, for settling a provision upon a parson, on the

building of a church; or the severing a sufficient portion of tithes for a vicar, when the benefice is appropriated.

ENDYMION, (fab. hist.), a shepherd, son of Æthlius and Calyce. It is said that he required of Jupiter to grant to him to be always young, and to sleep as much as he would; whence came the proverb of *Endymionis somnum dormire*, to express a long sleep. Diana saw him naked as he slept on mount Latmos; and was so struck with his beauty, that she came down from heaven every night to enjoy his company. Endymion married Chromia daughter of Itonus; by whom he had three sons Pæon, Epeus, and Æolus, and a daughter called *Eurydice*. The fable of Endymion's amours with Diana, or the moon, arose from his knowledge of astronomy; and as he passed the night on some high mountain to observe the heavenly bodies, it came to be reported that he was courted by the moon. Some suppose that there were two of that name; the son of a king of Elis, and the shepherd or astronomer of Caria. The people of Heraclea maintained that Endymion died on mount Latmos, and the Eleans pretended to show his tomb at Olympia in Peloponnesus.

ENEMY, in law, an alien or foreigner, who publicly invades the kingdom.

ENERGUMENS, in church-history, persons supposed to be possessed by the devil, concerning whom there were many regulations among the primitive Christians. They were denied baptism and the eucharist; at least, this was the practice of some churches: and though they were under the care of exorcists, yet it was thought a becoming act of charity, to let them have the public prayers of the church, at which they were permitted to be present. See EXORCISM.

ENERGY, a term of Greek origin, signifying the power, virtue, or efficacy of a thing. It is also used, figuratively, to denote emphasis of speech.

ENERVATING, the act of destroying the force, use, or office, of the nerves, either by cutting them, by weakening them with debauchery, or by some other violence.

Excess of wine, and other strong, hot, spirituous liquors, enervate or weaken the nerves. When they would render a horse useless, they enervate him, or cut his nerves.

ENFANS PERDUS, the same with forlorn-hope. See FORLORN.

ENFILADE, in the art of war, is used in speaking of trenches, or other places, which may be scourged by the enemy's shot along their whole length. In conducting the approaches at a siege, care must be taken that the trenches be not enfiladed from any work of the place.

ENFINE', formerly ANTINOË; a city of Egypt, built by Adrian in honour of his favourite Antinous. It is situated towards the middle of the Said, or Upper Egypt, and still contains several stately monuments of antiquity. In ancient times this city was very magnificent. It was about half a league in circumference, having two principal streets 45 feet wide, intersecting each other at right angles, and running thro' its whole length. The others were more narrow, but equally straight; the two largest having gates at each end, part of which still remain. According to the Nubian geographer, it

Endymion
Enfine.

Enfine
Engender-
ing.

was called the city of the Magi, because Pharaoh is said to have caused the magicians come from thence to his court. Near it were the ruins of Abydus, where there was an oracle of the god Besa, one of the most ancient in Egypt, and which was still famous in the time of Constantius; and hence some have derived the appellation just mentioned, the neighbouring people coming in crowds to consult the oracle.

The ruins of the gates are the most beautiful pieces of architecture to be met with in this place. The handsomest has three vaulted entries; the middle one being 40 feet in height, 22 wide, and 20 thick; the other two smaller. Each of the facades of this edifice is ornamented with four pilasters in bas relief, with Corinthian capitals, the acanthus leaves of which have a considerable projection. It was surrounded by eight Corinthian columns, of which only one now remains, but the pedestals of the rest are still entire. Besides these, there are heaps of rubbish in different parts of the town, apparently the remains of ancient temples or palaces. All these seem to have been bordered by a colonnade, forming a portico on each side, where the inhabitants might walk secure from the heat of the sun. One of the squares was ornamented with four large Corinthian pillars, three of which are destroyed all but the bases. The fourth is quite entire, about 50 feet high, and the shaft composed of several stones. The pedestal has a Greek inscription, pretty much defaced, dedicating it to the emperor Alexander Severus, to whom the senate of ALEXANDRIA had already dedicated the famous column mentioned under that article. These four other columns were therefore probably raised in honour of that emperor after his victories over the Persians; for the foliage of the oak, with which the first stone of the shaft is decorated, was a sign of victory among the Romans. Towards the end of the fourth century the city was peopled by Christians; and Palladius assures us, that there were at that place 12 convents of virgins, and several others inhabited by monks. In the environs there are still several coptic monasteries possessed by monks equally miserable and ignorant. The Nubian Geographer informs us, that the city was surrounded by a well cultivated country, abounding in fruits and harvests; but these have now given place to sands and barren deserts. The ruins of Abydus above mentioned are still to be seen near this place.

ENFRANCHISEMENT, in law, the incorporating a person into any society or body politic.

ENGASTRIMYTHI, in Pagan theology, the Pythians, or priestesses of Apollo, who delivered oracles from within, without any action of the mouth or lips.

The ancient philosophers, &c. are divided upon the subject of the engastrimythi. Hippocrates mentions it is a disease. Others will have it a kind of divination. Others attribute it to the operation or possession of an evil spirit. And others to art and mechanism. M. Scottus maintains that the engastrimythi of the ancients were poets, who, when the priests could not speak, supplied the defect by explaining in verse what Apollo dictated in the cavity of the bason on the sacred tripod.

ENGENDERING, a term sometimes used for the act of producing or forming any thing: thus meteors

are said to be engendered in the middle region of the atmosphere, and worms in the belly.

ENGINE, in mechanics, is a compound machine, made of one or more mechanical powers, as levers, pulleys, screws, &c. in order to raise, cast, or sustain any weight, or produce any effect which could not be easily effected otherwise. The word is formed of the French *engin*, from the Latin *ingenium* "wit;" by reason of the ingenuity required in the contrivance of engines to augment the effect of moving powers.

ENGINE for extinguishing Fires. See HYDROSTATICS, n° 33.

Pile ENGINE, one contrived for driving piles. See PILE-Engine.

Steam-ENGINE, a machine to raise water by fire, or rather by the force of water turned into steam. See STEAM-Engine.

ENGINEER, in the military art, an able expert man, who, by a perfect knowledge in mathematics, delineates upon paper, or marks upon the ground, all sorts of forts, and other works proper for offence and defence. He should understand the art of fortification, so as to be able, not only to discover the defects of a place, but to find a remedy proper for them; as also how to make an attack upon, as well as to defend, the place. Engineers are extremely necessary for these purposes: wherefore it is requisite, that besides being ingenious, they should be brave in proportion. When at a siege the engineers have narrowly surveyed the place, they are to make their report to the general, by acquainting him which part they judge the weakest, and where approaches may be made with most success. Their business is also to delineate the lines of circumvallation and contravallation, taking all the advantages of the ground; to mark out the trenches, places of arms, batteries, and lodgments, taking care that none of their works be flanked or discovered from the place. After making a faithful report to the general of what is a-doing, the engineers are to demand a sufficient number of workmen and utensils, and whatever else is necessary.

ENGLAND; the southern division of the island of Great Britain. Including Wales, it is of a triangular form, and lies between the 50th and 55th degrees of north latitude, extending about 400 miles in length from south to north, and in some places it is 300 miles in breadth. It is bounded by Scotland on the north; by the English Channel on the south, dividing it from France; by the German Sea on the east; and on the west by St George's, or the Irish, Channel.

At what time the island of Britain was peopled is Whence uncertain; nor do we know whether the southern or northern parts were first inhabited. We have no accounts that can be depended upon before the arrival of Julius Cæsar, and it is certain he found the southern parts full of people of a very warlike disposition. These people, according to Cæsar, were a colony of the Gauls; and this opinion is embraced by most of the ancient as well as modern writers. It is chiefly founded on the agreement observed by the Romans between the two nations in their customs, manners, language, religion, government, way of fighting, &c. The more northern inhabitants, according to Tacitus,

Engene
England.



A. Bell sculp.

VIII

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Minutes of Time XXXVII West from London

England. tus, came from Germany. This he infers from the make of their limbs; but Cæsar simply calls them *A-lorigenes*.

²
Inhabited
by 17 dif-
ferent na-
tions.

England, including the principality of Wales, when first invaded by the Romans, was divided into 17 petty states. 1. The Danmonii, called also *Dunmonii* and *Donmonii*, inhabiting the counties of Cornwall and Devonshire. 2. The Durotriges, who inhabited the track now called *Dorsetshire*. 3. The Belgæ possessed Somersetshire, Wiltshire, and Hampshire. 4. The Atrebatii, or inhabitants of Berkshire. 5. The Regni, whose country bordered on that of the Atrebatii, and comprehended Surrey, Suffex, and part of the sea-coast of Hampshire. 6. The Cantii, inhabiting the county now called *Kent*. 7. The Dobuni are placed by Ptolemy on the north side of the Thames, near its head, in the counties of Gloucestershire and Oxfordshire. 8. The Cattieuchlani, *Calveuchlani*, *Cattidudani*, or *Cathicudani*, inhabited Buckinghamshire, Bedfordshire, and Hertfordshire. 9. The Trinobantes, who possessed the counties of Essex and Middlesex. 10. The Iceni, whose country comprehended Suffolk, Norfolk, Cambridge, and Huntingdonshire. These are by Ptolemy called *Simeni*, and by others *Tigeni*. Camden is of opinion, that they were the same whom Cæsar calls *Cenomagni*. 11. The Coritani, whose country comprehended Northamptonshire, Leicestershire, Rutlandshire, Lincolnshire, Nottinghamshire, and Derbyshire. 12. The Cornavii possessed Warwickshire, Worcestershire, Staffordshire, Shropshire, and Cheshire. 13. The Silures inhabited the counties of Radnorshire, Brecknockshire, Glamorganshire, with Herefordshire and Monmouthshire. 14. The Demetæ inhabited part of Carmarthenshire, Pembrokeshire, and Cardiganshire. 15. The country of the Ordovices comprehended Montgomeryshire, Merionethshire, Caernarvonshire, Denbighshire, and Flintshire. 16. The Brigantes possessed the countries of Yorkshire, the bishopric of Durham, Lancashire, Westmoreland, and Cumberland. 17. The county of Northumberland was held by the Ottadini, Ottadeni, or Ottalini. Their country, according to some, reached from the Tine to the river Forth; though the most common opinion is, that it reached only to the Tweed.

The above-mentioned names of these nations are plainly Roman, but the etymology of them is not easily ascertained. Some attempt to derive them from words in the Old British language; but as this subject at best must be very obscure and uncertain, we shall not enter into it.

³
Julius Cæ-
sar under-
takes an ex-
pedition in-
to Britain.

Before the time of Julius Cæsar, the Romans had scarcely any knowledge of Britain; but that conqueror having subdued most of the Gallic nations on the opposite side of the channel, began to think of extending his conquests by the reduction of Britain. The motive for this expedition, ascribed to him by Suetonius, was a desire of enriching himself by the British pearls, which were then very much esteemed. The pretence, however, which he made use of in order to justify his invasion was, that the Britons had sent assistance to the Gauls during his wars with them.

Cæsar undertook his first expedition against Britain when the summer was already far spent, and therefore he did not expect to finish the conquest of the country that campaign. He thought, however, that it would

be a considerable advantage to view the island, and learn something of the manners and customs of the natives; after which he could more easily take such measures as would ensure a permanent conquest on his return. Having marched all his forces into the country of the Morini, now the province of Picardy, from whence was the shortest passage into Britain; he ordered at the same time all the vessels that lay in the neighbouring ports, and a fleet which he had built the year before for an expedition against the Morini, to attend him. The Britons, alarmed at his preparations, sent ambassadors with offers of submission; but Cæsar, though he received them with great kindness, did not abandon his intended scheme of an invasion. He waited till the arrival of C. Volusenus, whom he had sent out with a single galley to make discoveries on the coast. Volusenus did not think proper to land; but, having made what observations he could, returned after five days absence, and Cæsar immediately set sail for Britain. His force consisted of two legions embarked on board 80 transports; and he appointed 18 more which lay wind-bound about eight miles off, to convey over the cavalry; but these last orders were too slowly executed, which occasioned some difficulty in his landing.

The Britons at this time, according to Cæsar and other Roman historians, were very numerous, and had their country well stocked with cattle. Their houses resembled those of the Gauls; and they used copper or iron plates weighed by a certain standard instead of money. Their towns were a confused parcel of huts placed at a small distance from one another, generally in the middle of a wood, to which all the avenues were slightly guarded with ramparts of earth, or with trees. All the nations were in a state of the most wretched barbarism, even when compared with the barbarous Gauls on the continent. The use of clothes was scarce known in the island. Only the inhabitants of the southern coast covered their nakedness with the skins of wild beasts; and this rather to avoid giving offence to the strangers who came to trade with them, than out of any principle of decency. It was a general custom among the Britons to paint their bodies with the juice of woad; but whether this was designed as ornament, or for any other purpose, is not known. They shaved their beards, all except their upper lip, and wore long hair. They also had their wives in common, a custom which made them detestable to all other nations.

The arms of the Britons were a sword, a short lance, and a shield. Breast-plates and helmets they looked upon rather to be incumbrances, and therefore made no use of them. They usually fought in chariots, some of which were armed with scythes at the wheels; they were fierce and cruel, and exceedingly blood-thirsty. When driven to distress, they could subsist themselves even on the bark and roots of trees; and Dio Cassius tells us, that they had ready, on all occasions, a certain kind of food, of which, if they took but the quantity of a bean, they were not troubled with hunger or thirst for a considerable time after. The southern nations, however, were somewhat more civilized; and the Cantii, or inhabitants of Kent, more so than any of the rest.

All the British nations at this time were very brave and

England.

⁴
Manners,
customs,
&c. of the
Britons.

England.

5
They op-
pose Cæ-
sar's land-
ing.

and resolute, owing to the continual dissensions among themselves. They proved therefore very formidable enemies to the Romans; but the same dissensions which had taught them the art of war, also prevented them from uniting in the defence of their country. As soon as they perceived Cæsar's fleet approaching, a number of cavalry and chariots were dispatched to oppose his landing, while a considerable body of infantry hastened after. What chiefly embarrassed the Romans in their attempt to land, was the largeness of their ships, which required a considerable depth of water. The soldiers therefore were obliged to leap into the sea while loaded with their armour; and at the same time to encounter the enemy, who were quite disengaged, as they either stood on dry ground, or waded but a little way into the water. Cæsar perceiving this disadvantage, ordered his galleys to advance, with their broad sides towards the shore, in order to drive the Britons from the water-side with their slings and arrows. On this the Britons, surprised at the galleys, a sort of shipping they had never before seen, began to give ground. The fight, however, continued for some time, greatly to the disadvantage of the Romans; till at last Cæsar, observing the distress of his men, caused several boats to be manned, and sent them to the assistance of those who were most exposed to the enemy's assault. The Romans then soon got the better of the undisciplined barbarians, however brave, and made good their landing; but they were unable to pursue the enemy for want of cavalry, which had not yet arrived.

6
They are
defeated
and sue for
peace.

The Britons were so disheartened with this bad success, that they immediately sent ambassadors to sue for peace; which was granted, on condition of their delivering a certain number of hostages for their fidelity. Part of these they brought immediately; and promised to return in a few days with the rest, who, they said, lived at some distance. But, in the mean time, the 18 transports which carried Cæsar's cavalry, being driven back by a violent storm, and the fleet which lay in the road being greatly damaged by the same, the Britons thought proper to break their engagements. Having therefore privately assembled their forces, they fell unexpectedly on the seventh legion while at a distance from the rest and busied in foraging. Cæsar being apprised of their danger, hastened to their assistance with two cohorts, and at last repulsed the enemy.—This, however, proved only a temporary deliverance; for the Britons, thinking it would be possible for them to cut off all the Romans at once, dispatched messengers to inform several of the neighbouring nations of the weakness of the enemy's forces, and the happy opportunity that offered itself of destroying all these invaders at one blow.—On this, they drew together a great body of horse and foot, which boldly advanced to the Roman intrenchments. But Cæsar came out to meet them; and the undisciplined Britons being by no means able to cope with the Romans, were put to flight with great slaughter. Having burnt several towns and villages, the victors returned to their camp, where they were soon followed by new deputies from the Britons. Cæsar being in want of horse, and afraid lest another storm should destroy the remainder of his fleet, granted them peace, on condition of their sending him double the number

N^o 115.

of hostages into Gaul which they had before promised. England. The same night he set sail, and soon arrived safe in Gaul.

The Britons no sooner perceived the Romans gone, than, as before, they broke through their engagements. Of all the states who had promised to send hostages, only two performed their promises; and this neglect so provoked Cæsar, that he determined to re-
turn the year following with a far greater force. Ha-
ving, therefore, caused his old vessels to be refitted, and a great many new ones to be built, he arrived off the coast of Britain with a fleet of 600 ships and 28 galleys. The Britons made no opposition to his landing; but Cæsar, getting intelligence that an army was assembled at no great distance, marched in quest of them. He found them encamped on the banks of a river, supposed to be the *Stour*, about 12 miles distant from the place where he had landed. They attempted to oppose his passage; but being briskly attacked by the Roman cavalry, they were obliged to retire into a wood, all the avenues of which were blocked up by trees cut down for that purpose. This fortification, however, proved insufficient to protect them. The
seventh legion having cast themselves into a testudo, and thrown up a mount against their works, drove them from their asylum; but as the day was far spent, a pursuit was not thought advisable.

Next morning Cæsar, with the greatest part of his army, which he divided into three bodies, marched out in quest of the enemy. But when he was already come in sight of their rear, he was overtaken by messengers, who informed him, that his fleet was greatly damaged by a violent storm which had happened the preceding night. This put an end to the pursuit for that time; but Cæsar having employed all the carpenters he had with him, and sent for others from Gaul, in order to repair the damage, resolved to prevent misfortunes of this kind for the future. He therefore drew all his ships ashore, and inclosed them within the fortifications of his camp. This arduous undertaking employed his whole army for 10 days; after which he again set out in quest of the enemy.

The Britons had made the best use they could of the respite afforded them by the storm. They were headed by Cassibelanus king of the Trinobantes. He had formerly made war upon his neighbours; and having rendered himself terrible to them, was looked upon to be the most proper person for leading them on against the common enemy; and as several states had now joined their forces, the British army was very numerous. Their cavalry and chariots attacked the Roman army while on their march; but were repulsed with loss, and driven into the woods. The Romans pursued them too eagerly, and thus lost some of their own men; which encouraged the Britons to make another fierce attack; but in this also they were finally unsuccessful, and obliged to retire, though their loss seems not to have been great.

Next day the Britons suddenly attacked the Roman legions as they were foraging; but meeting with a vigorous resistance, they soon betook themselves to flight. The Romans pursued them so closely, that having neither time to rally nor get down from their chariots according to custom, great numbers of them were cut in pieces: and this overthrow had such an effect upon the auxiliaries

8
Cæsar re-
turns.

9
Defeats the
Britons.

England. auxiliaries of Cassibelaunus, that all of them abandon-
ed him; nor did the Britons ever afterwards engage
Cæsar with united forces. Cæsar, pursuing his victory,
marched towards the Thames, with a design to cross
that river, and enter the territories of the Trinobantes.
The river was fordable only at one place, and that not
without great difficulty; but when he came to it, he
found the enemy's forces drawn up in a considerable
body on the opposite bank, which was fortified with
sharp stakes. They had likewise driven many stakes
of the same kind into the bottom of the river, the
tops of which were covered with water. These stakes
are visible to this day at a place called *Walton* in Sur-
ry. They are made of oak; and though they have been
so long in the water, are as hard as Brazil, and as black
as jet; and have sometimes been pulled out in order to
make knife-handles of them.

II Gives the Britons, fre-
quent over-
throws. Cæsar was not at all dismayed at these difficulties,
which he had intelligence of by prisoners and desert-
ers. He ordered the cavalry to enter first, and the
foot to follow. His orders were obeyed, and the sol-
diers advanced with such resolution, that though the
infantry were up to the chin in water, the enemy, un-
able to sustain their assault, abandoned the bank and
fled. After this defeat, Cassibelaunus himself despair-
ed of success, and therefore dismissed all his forces ex-
cept about 4000 chariots, with which he observed the
motions of the Romans, harassing them by cutting
off straggling parties, &c. This, however, was not
sufficient to keep up the spirits of his countrymen. On
the contrary, they deposed him from the kingdom, and
chose Mandubratius, whose father had been murdered
by Cassibelaunus, who thereupon usurped the kingdom.
The young prince had fled to Cæsar, who gave him
protection; and the Trinobantes now offered to submit
to the conqueror, provided he would give them Man-
dubratius for their king.

Cæsar readily complied with the request of the Tri-
nobantes upon their sending him 40 hostages: and the
submission of the Trinobantes was soon followed by
that of other states and tribes; for each of the 17 na-
tions already mentioned were composed of several diffe-
rent tribes, of which no particular account can be gi-
ven.—Cæsar next marched to Verulamium, or Canter-
bury, which was Cassibelaunus's capital, and which he
still kept possession of; but tho' the place was strong-
ly fortified both by nature and art, the Britons were
unable to bear the assault of the Romans, and there-
fore soon fled out at one of the avenues. Many were
taken as they attempted to make their escape, and ma-
ny more cut in pieces.

After this loss, Cassibelaunus, as his last resource,
found means to draw into confederacy with him four
kings of the Cantii. But though Cæsar gives them
the title of kings, it is probable that they were only
petty princes, tributary to the king of that nation.
Their names were Cingetorix, Corvilius, Taximagu-
lus, and Segonax. These, having raised what forces
they could, attacked the camp where the ships were
laid up: but the Romans having made a sally, repul-
sed them with great slaughter, and then returned to
their trenches without any loss; after which, Cassibe-
launus thought proper to submit to the conqueror. As
the summer was already far spent, Cæsar hearkened to
his proposals. A peace was concluded on the follow-

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ing terms, viz. that the Britons should pay an annual
tribute to the Romans, that Cassibelaunus should leave
Mandubratius in peaceable possession of his dominions,
that he should not molest the Trinobantes, and that he
should deliver a certain number of hostages. These
terms being agreed to, Cæsar set sail with his whole
fleet from Britain, to which he never returned.

Such is the account given by Cæsar himself of his
two expeditions into Britain; but other authors have
spoken very doubtfully of his victories in this island.
Dio Cassius tells us, that the Britons utterly defeated
the Roman infantry, but were at last put in disorder by
their cavalry. Horace and Tibullus, in many parts of
their works, speak of the Britons as a people not yet
conquered. Tacitus says, that Cæsar rather showed
the Romans the way to Britain, than put them in pos-
session of it; and Lucan tells us plainly, that Cæsar
turned his back to the Britons and fled. This last,
however, considering the consummate military genius
of Cæsar, is by no means probable. That he left
Britain during the winter, was, in all probability, to
prevent insurrections among the Gauls, which might
very readily have happened; and that he did not re-
turn to finish his conquest can be no wonder, seeing his
ambition would certainly be more gratified by being
called emperor of Rome, than conqueror of Britain.

The departure of Julius Cæsar, which happened a-
bout 53 years before Christ, left the Britons without
any fear of a foreign enemy. We are not, therefore, to
imagine, that they would regard their promises of pay-
ing tribute; nor was it probably demanded for a good
number of years afterwards. Augustus, however, when
he had got himself fully established on the throne, had
twice a design of invading Britain and forcing the in-
habitants to pay the tribute promised to Julius Cæsar.
Both times, however, he was prevented by revolts in
different provinces in the empire, so that the Britons
still continued to enjoy their liberty. They thought
proper, however, to court the favour of the Romans as
much as they could by pretended submissions; but, in
the reign of Claudius, the Romans set about reducing
them to subjection in good earnest. The occasion of
this war is related by Dio Cassius as follows. "Cu-
nobelinus, the third in succession from Cassibelaunus,
being dead, his two sons, Togodumnus and Carac-
tacus, succeeded to the throne; but whether they
reigned jointly or separately, is not known. In their
reign one Bericus, of whom we also know very little,
being driven out of the island for attempting to raise a
sedition, fled with some of his partisans to Rome, and
persuaded Claudius to make war on his countrymen.
The Britons, on the other hand, resented the behavi-
our of Claudius in receiving these vagabonds, and
therefore prohibited all intercourse with the Romans.
A much smaller offence than this would have been suf-
ficient at any time to provoke that haughty nation to
declare war. An army was therefore immediately or-
dered into Britain, under the command of Plautius præ-
tor in Gaul. The soldiers at first refused to embark,
from a superstitious notion, that they were going to be
sent without the compass of the world; and this mu-
tiny being related to the Britons, they did not make
the necessary preparations for their own defence. The
Roman soldiers were soon brought to a sense of their
duty; and set out from three different ports, in order

4. E

to

England.

12
He leaves
the island
altogether.

13
Why the
war with
the Romans
was renew-
ed.

Eng'and. to land in three different places of Britain at once. Being driven back by contrary winds, their fears began to return; but they resumed their courage on the appearance of a meteor shooting from the east, which they imagined was sent from heaven to direct their course. They landed without opposition; and the Britons, not having drawn together a sufficient army, kept in small bodies behind their marshes, and in woods, in order to spin out the war till winter; which they imagined Plautius would, like Cæsar, spend in Gaul.

14
The Britons defeated.

The Roman general marched first in quest of the two kings Togodumnus and Caractacus; both of whom he found out, and defeated one after another. He then reduced part of the Dobuni, at that time subject to the Cattieuchlani; and leaving a garrison to keep them in awe, he advanced to a river where the Britons lay carelessly encamped, supposing that the Romans could not pass it without a bridge. But the Germans in the Roman army had been accustomed to swim across the strongest currents in their heavy-armour. They therefore passed the river first; and having, according to their orders, fallen only upon the enemy's horses which drew their chariots, these formidable machines were rendered entirely useless; and the Britons were put to flight as soon as another part of the forces could pass the river.

The Britons were not disheartened with this defeat, but engaged the Romans next day with great bravery. Victory continued long doubtful; but at length the Romans prevailed, and the Britons were forced to betake themselves to flight. This battle is thought to have been fought on the banks of the Severn. From thence the Britons fled to the mouth of the Thames. They were closely pursued by the Romans; but the latter being unacquainted with the flats and shallows of the river, were often in great danger. The Germans, however, crossed by swimming as before, and the rest on a bridge somewhat farther up the river; so that the Britons were in a short time surrounded on all sides, and great numbers of them cut in pieces. Many of the Romans, also, pursuing the fugitives with too great eagerness, were lost in the marshes.—In one of these battles Togodumnus was killed; but the Britons were so far from being disheartened, that they showed more eagerness than ever to oppose the Romans, in order to revenge his death. Plautius, therefore, did not think proper to penetrate farther into the country, but contented himself with putting garrisons in the places he had already conquered. He then wrote to the emperor himself; who no sooner received an account of his success, than he set out for Britain; where, having landed after a short voyage, he joined Plautius on the banks of the Thames.

15
Claudius arrives in Britain.

Soon after the arrival of Claudius, the Romans passed the Thames, attacked the British army, and totally defeated it. The consequence of this was the taking of Cunobelinus's capital, and the submission of several of the neighbouring states. The emperor, however, did not make a long stay in the island, but left Plautius to pursue his conquests. This he did with such success, that, on his return to Rome, he was met without the gates by the emperor himself, who, at his solemn entry, gave him the right hand.—The Britons seem to have made a very obstinate resistance to the Roman arms about this time. Vespasian, who

was afterwards emperor, is said to have fought 30 battles with them; and the exploits of Titus his son are also much celebrated by the Roman historians.

In the ninth year of Claudius, P. Ostorius Scapula was sent into Britain. By far the greater part of the 17 nations formerly mentioned were at this time unconquered. Some of these had broken into the Roman territories; but Ostorius falling unexpectedly upon them, put great numbers to the sword, and dispersed the rest. To prevent them for the future from making inroads into the territories of the Romans or their allies, he built several forts on the Severn, the Avon, and the Nen, reducing the country south of these rivers to a Roman province. This so highly offended the Iceni, that, being joined by the neighbouring nations, they raised a considerable army, and encamped in an advantageous situation, in order to prevent the Romans from penetrating farther into the island. Ostorius, however, soon advanced against them. The Romans, as usual, got the victory, and the enemy were pursued with great slaughter. The Roman general then, having quelled an insurrection among the Brigantes, led his army against the Silures. They were headed by their king Caractacus, a most renowned warrior. He showed his military talents by choosing a very advantageous place for engaging the enemy. Tacitus tells us, "it was on the ridge of an exceeding steep mountain; and where the sides of it were inclining and accessible, he reared walls of stone for a rampart. At the foot of the mountain flowed a river dangerous to be forded, and an army of men guarded his entrenchments." This hill is thought to be one called *Caer-Cardoc* in Shropshire, situated near the conflux of the rivers Colun and Teme, and where the remains of ancient entrenchments are still visible.—On the approach of the enemy, Caractacus drew up his troops in order of battle, animating them with the following speech, according to Tacitus. "That from this day, and this battle, they must date their liberty rescued, or their slavery for ever established. He then invoked the shades of those heroes who had expelled Cæsar the dictator; those brave men by whose valour they still enjoyed freedom from Roman tribute and taxes, and by which their wives and children were as yet preserved from prostitution." The whole army then took a solemn oath either to conquer or die, and prepared for the charge with the most terrible shouts. Ostorius was somewhat dismayed when he considered the uncommon fierceness of the enemy, and the other difficulties which he had to encounter. He led on his men, however, to the charge; and the Romans were attended with their usual good fortune. The Britons were put to flight. Vast numbers fell on the field of battle and in the pursuit, and many more were taken prisoners. Among the latter were the wife, the daughter, and the brothers, of Caractacus. The unfortunate prince himself fled to Cartimundua queen of the Brigantes, by whom he was delivered up to the Roman general, who sent him in chains to Rome. Caractacus bore his misfortunes with magnanimity; and when he came before the emperor, addressed him in the following terms. "If my moderation in prosperity, O Claudius! had been as conspicuous as my birth and fortune, I should now have entered this city as a friend, and not as a prisoner; nor would you have disdained

16
Caractacus defeated and taken prisoner.

17
His speech to the Roman emperor.

England. the friendship of a prince descended from such illustrious ancestors, and governing so many nations. My present condition, I own, is to you honourable, to me humiliating. I was lately possessed of subjects, horses, arms, and riches. Can you be surprised that I endeavoured to preserve them? If you Romans have a desire to arrive at universal monarchy, must all nations, to gratify you, tamely submit to servitude? If I had submitted without a struggle, how much would it have diminished the lustre of my fall, and of your victory? And now, if you resolve to put me to death, my story will soon be buried in oblivion; but if you think proper to preserve my life, I shall remain a lasting monument of your clemency."—This speech had such an effect upon Claudius, that he immediately pardoned Caractacus and his whole family, and commanded them to be set at liberty.

18
General re-
volt of the
Britons.

The Silures, notwithstanding this terrible blow, continued the war with great vigour, and gained considerable advantages over the Romans; which so much affected Ostorius, that he died of grief. He was succeeded by A. Didius, who restrained the incursions of the Silures, but was not able to restore Cartimundua queen of the Brigantes, who had been deposed by her subjects. Didius was succeeded by Veranius, and he by Suetonius Paulinus, who reduced the island of *ANGLESEY*, as related under that article. But while Paulinus was employed in the conquest of this island, he was alarmed by the news of an almost universal revolt among those nations which had submitted to the Romans. The Britons, tho' conquered, had still a desire of returning to their former state of independence; and the Roman yoke became every day more unsupportable to them through the insolence and oppressions of the Roman soldiers. The Britons had been long discontented, and were already in a very proper disposition for a revolt, when an event happened which kindled these discontents into an open flame. Prasutagus, king of the Iceni, a prince renowned for opulence and grandeur, had, by his last will, left the Roman emperor joint-heir with his two daughters, in hopes of obtaining his favour and protection by so great an obligation. But the event turned out very different. No sooner was he dead, than his houses and possessions were all plundered by the Roman soldiers. The queen Boadicea remonstrated against this injustice; but, instead of obtaining any redress, she herself was publicly whipped, her daughters ravished, and all the relations of the late king reduced to slavery. The whole country also was plundered, and all the chiefs of the Iceni deprived of their possessions.

Boadicea was a woman of too haughty a spirit tamely to bear such indignities. She therefore persuaded the Iceni to take up arms, which they very readily did. Then, being joined by the Trinobantes, and some other nations, they poured like a torrent on the Roman colonies. Every thing was destroyed with fire and sword. The ninth legion, which had been left for the defence of the country under Petilius Cerealis, was defeated, the infantry totally cut in pieces, and the commander himself with the cavalry escaped with the utmost difficulty. Suetonius, alarmed at this news, immediately left Anglesey, and marched with the greatest expedition to London. The inhabitants were overjoyed at his arrival, and used their utmost endea-

vours to detain him for their defence. But he refused to stay, and in a short time left the place, notwithstanding the intreaties of the inhabitants. The whole city lamented his departure; and they had reason. Suetonius was scarce gone, when Boadicea with her Britons entered, and put all they found in it to the sword. None were taken prisoners, nor was any sex or age spared, and many were tortured in the most cruel manner. Seventy thousand persons are said to have perished on this occasion at London and other Roman colonies.

The Britons, now elated with success, assembled from all quarters in great numbers, so that Boadicea's army soon amounted to 230,000 men. They despised the Romans; and became so confident of victory, that they brought their wives and children along with them in waggons to be spectators of the destruction of their enemies. The event was what might naturally have been expected from such ill-judged confidence. The Britons were overthrown with most terrible slaughter, no fewer than 80,000 being killed in the battle and pursuit; while the Romans had not above 400 killed, and not many more wounded. Boadicea, not able to survive so great a calamity, put an end to her life by poison.

By this overthrow the Britons who had once been subdued were thoroughly prevented from raising any more insurrections, and even those who had not yet submitted to the Roman yoke seemed to be intimidated from making incursions into their dominions. Nothing remarkable therefore happened for some time. In the time of Vespasian, Petilius Cerealis being appointed governor of Britain, attacked the Brigantes, defeated them in several battles, and reduced great part of their country. He was succeeded by Julius Frontinus; who not only maintained the conquests of his predecessor, but reduced entirely the warlike nation of the Silures. Frontinus was succeeded by the celebrated Cneius Julius Agricola, who completed the conquest of all the southern Britons.

Just before the arrival of Agricola, the Ordovices had cut in pieces a band of horse stationed on their confines, after which the whole nation had taken arms. The summer was pretty far spent, and the Roman army was quite separated and dispersed, the soldiers having assured themselves of rest for the remaining part of the year. Agricola, however, was no sooner landed, than, having drawn together his legions, he marched against the enemy without delay. The Britons kept upon the ridges of the mountains; but Agricola led them in person up the ascents. The Romans were victorious; and such a terrible slaughter was made of the Britons that almost the whole nation of Ordovices was cut off. Without giving the enemy time to recover from the terror which this overthrow had occasioned, Agricola resolved upon the immediate reduction of Anglesey, which had been lost by the revolt of Boadicea. Being destitute of ships, he detached a chosen body of auxiliaries who knew the fords, and were accustomed to manage their arms and horses in the water. The Britons, who had expected a fleet and transports, were so terrified by the appearance of the Roman forces on their island, that they immediately submitted, and Anglesey was once more restored to the Romans.

With the conquest of Anglesey ended the first campaign.

England.

19
They de-
stroyed
Romans.

20
They are
utterly de-
feated.

21
Britain con-
quered by
Agricola.

England.

paigned Agricola; and he employed the winter in reconciling the Britons to the Roman yoke. In this he met with such success, through his wise and equitable conduct, that the Britons, barbarous as they were, began to prefer a life of security and peace, to that independency which they had formerly enjoyed, and which continually exposed them to the tumults and calamities of war. The succeeding campaigns of Agricola were attended with equal success; he not only subdued the 17 nations inhabiting England, but carried the Roman arms almost to the extremity of Scotland. He also caused his fleet to sail round the island, and discovered the Orcades, or Orkney islands, which had before been unknown to the rest of the world. His expedition took him up about six years, and was completed in the year of Christ 84.

* See A.
Adrian.

† See An-
toninus's
wall.

22
Expedition
of Severus
into Bri-
tain.

Had this commander been continued in Britain, it is probable that both Scotland and England would have been permanently subdued; but he was recalled by Domitian in the year 85, and we are then almost totally in the dark about the British affairs till the reign of the emperor Adrian. During this interval the Caledonians had taken arms, and not only refused subjection to the Roman power themselves, but ravaged the territories of the Britons who continued faithful to them. Adrian, for what reason is not well known, abandoned to them the whole track lying between the Tyne and the Forth. At the same time, in order to restrain them from making incursions into the Roman territories, he built a wall 80 miles in length from the river Eden in Cumberland to the Tyne in Northumberland*. He was succeeded by Antoninus Pius, in whose reign the Brigantes revolted; and the Caledonians, having in several places broken down the wall built by Adrian, began anew to ravage the Roman territories. Against them the emperor sent Lollius Urbicus, who reduced the Brigantes; and having defeated the northern nations, confined them within narrower bounds by a new wall†, extending probably between the friths of Forth and Clyde. From the time of Antoninus to that of Severus, the Roman dominions in Britain continued to be much infested by the inroads of the northern nations. That emperor divided Britain into two governments, the southern and northern; but the governor of the northern division was so harassed by continual incursions of the Caledonians, that he was at length obliged to purchase a peace with money. The Caledonians kept the treaty for 15 years; after which, breaking into the Roman territories anew, they committed terrible ravages. Virius Lupus the governor, not being in a condition to withstand them, acquainted the emperor with his distress, intreating him to send powerful and speedy supplies. Upon this Severus resolved to put an end to the perpetual incursions of the enemy by making a complete conquest of their country; for which purpose he set out for Britain, together with his two sons Caracalla and Geta, at the head of a numerous army. The Caledonians no sooner heard of his arrival, than they sent ambassadors offering to conclude a peace upon honourable terms. But these the emperor detained till he was ready to take the field, and then dismissed them without granting their request.

As soon as the season was fit for action, Severus

England. marched into the territories of the Caledonians, where he put all to fire and sword. He advanced even to the most northerly parts of the island; and though no battle was fought in this expedition, yet through the continual ambuscades of the enemy, and the inhospitable nature of the country, he is said to have lost 50,000 men. At last the Caledonians were obliged to sue for peace; which was granted them on condition of their yielding part of their country, and delivering up their arms. After this the emperor returned to York, leaving his son Caracalla to command the army, and finish the new wall which had been begun between the friths of Forth and Clyde. But the emperor being taken ill at York, the Caledonians no sooner heard of his indisposition, than they again took up arms. This provoked Severus to such a degree, that he commanded his son Caracalla to enter their country anew with the whole army, and to put all he met to the sword without distinction of sex or age. Before these orders, however, could be put in execution, his two sons, having concluded a shameful peace with the Caledonians, returned to Rome.

A long chasm now takes place in the history of the Roman dominions in Britain. In the beginning of Dioclesian's reign, Carausius a native of Gaul, passing over into Britain, took upon him the title of *emperor*, and was acknowledged by all the troops quartered here. He was, however, killed in a battle with one of Constantius's officers, after he had enjoyed the sovereignty for six or seven years. Constantine the Great began his reign in this island; and returned soon after he had left it, probably with a design to put a stop to the daily incursions of the Caledonians. He altered the division of that part of Britain subject to the Romans. Severus had divided it only into two provinces; but Constantine increased the number to three: *viz.* Britannia Prima, Britannia Secunda, and Maxima Cæsariensis; and this last was afterwards divided into two, *viz.* Maxima Cæsariensis and Flavia Cæsariensis. The removal of the imperial seat from Rome to Constantinople, which happened in the reign of Constantine, gave the northern nations an opportunity of making frequent incursions into the Roman provinces; the emperor having carried with him, first into Gaul, and then into the East, not only most of the Roman troops, but likewise the flower of the British youth.

About the latter end of the reign of Constantius son to Constantine the Great, the government of the province of Britain and other western parts of the empire, was committed to Julian, afterwards called the *apostate*. While he was in his winter-quarters at Paris, he was informed that the Scots and Picts, about this time first distinguished by these names, had broken into the Roman territories and committed every where dreadful ravages. Against them Julian dispatched a body of troops under the command of Lupicinius. He embarked from Bologne in the depth of winter, but was no sooner arrived at London than he was recalled; the enemy having probably found means to appease Julian by their submissions. Till the reign of Valentinian I. these nations still continued to infest the Roman territories in Britain, and had now reduced the country to a most deplorable condition by their continual ravages. Valentinian sent against them Theodosius, father to the emperor of that name. That general

England.

ral having divided his forces into several bodies, advanced against the enemy, who were roving up and down the country. The Scots and Picts were obliged to yield to the superior valour and discipline of the Romans. Great numbers were cut in pieces; they were forced to abandon all the booty and prisoners they had taken, and to retire beyond the friths of Forth and Clyde. Theodosius then entered London in triumph, and restored that city to its former splendor, which had suffered greatly by the former incursions of the northern Britons. To restrain them from breaking anew into the provinces, Theodosius built several forts or castles between the two friths; and having thus recovered all the country between Adrian's wall and the friths of Forth and Clyde, he formed of it a fifth province which he called *Valentia*.

Though Britain was now reduced to a state of temporary tranquillity, yet as the Roman empire was daily declining, it is not to be supposed that sufficient care could be taken to secure such a distant province. In the reign of the emperor Honorius, the provincial Britons found themselves annoyed not only by the Scots and Picts, but also by the depredations of the Saxons, who began to commit ravages on the sea-coasts. By the care, however, of Stilicho, prime minister to Honorius, matters were once more settled, and a particular officer was appointed to guard the coast against the attempts of the Saxons, with the title of *Comes limitis Saxonici*. But, not long after, the empire being over-run by barbarians, most of the Roman troops quartered in Britain were recalled, and the country left quite open to the attacks of the Scots and Picts.

23
The Britons choose an emperor of their own.

Upon this the provincials expecting no more assistance from Honorius, resolved to set up an emperor of their own. Accordingly they invested with the imperial dignity one *Mark*, an officer of great credit among them. Him they murdered in a few days, and placed on the throne one Gratian a native of Britain. After a reign of four months, Gratian underwent the fate of his predecessor; and was succeeded by *Constantine*, a common soldier, who was chosen merely for the sake of his name. He seems, however, to have been a man of some knowledge and experience in war. He drove the Scots and Picts beyond the limits of the Roman territories; but being elated with this success, he would now be satisfied with nothing less than the conquest of the whole Roman empire. He therefore passed over into Gaul; and took with him not only the few Roman forces that had been left, but such of the provincial Britons as were most accustomed to arms. That unhappy people, being now left entirely defenceless, were harassed in the most cruel manner by their enemies; who broke into the country, and destroyed all with fire and sword. In this miserable situation they continued from the year 407, when the usurper Constantine passed over into Gaul, till the year 410. Having during the last three years frequently implored assistance from Rome without receiving any, they now resolved to withdraw their allegiance from an empire which was no longer able to protect them. Honorius himself applauded their conduct; and advised them by letters to provide for their own safety, which was in effect an implicit resignation of the sovereignty of the island.

The provincial Britons now regained their liberty;

but they had lost the martial spirit which had at first rendered them so formidable to the Romans. They seem, however, to have met with some success in their first enterprises; for Zosimas tells us, that they delivered their cities from the insults of an haughty enemy. But being at last overpowered, they were again obliged to have recourse to the Roman emperor, to whom they promised a most perfect submission, provided they were delivered from the hands of their merciless and implacable enemies. Honorius, touched with compassion, sent a legion to their relief. The Roman forces landed in Britain unexpectedly; and having destroyed great numbers of the Scots and Picts, they drove them beyond the friths of Forth and Dunbritton. After this they advised the natives to build a wall on the isthmus from sea to sea, and to reassume their courage, and defend themselves from their enemies by their own valour. The Romans then quitted the country; being obliged to return, in order to repulse those barbarians who had broken into the empire from all quarters.

The Britons immediately set about building the wall, as they had been desired, with great alacrity. But as it was constructed only of turf, the Scots and Picts soon broke it down in several places; and, pouring in upon the defenceless and effeminate provincials, committed more cruel ravages than ever. At last, after very many and grievous calamities, the latter sent ambassadors once more to Rome. These appeared with their garments rent and dust on their heads; and at last prevailed on the emperor, by their earnest intreaties, to send another legion to their relief. The troops arrived in Britain before the enemy had the least knowledge of their having set sail. They were therefore quite unprepared for an attack, and roving up and down the country in the utmost disorder. The Romans made a terrible havock among them, and drove the remainder into their own country. As Honorius had sent them not with any ambitious view of retaining the island in subjection, but merely out of compassion to the unhappy provincials, the Romans told them, they had now no farther assistance to expect from them. They informed them, that the legion must immediately return to the continent, to protect the empire from the barbarians, who had extended their ravages almost to every part of it; and therefore, that they must now take their last farewell of Britain, and totally abandon the island. After this declaration Gallio, the commander of the Roman troops, exhorted the provincials to defend themselves, by fighting bravely for their country, wives, and children, and what ought to be dearer than life itself, their liberty; telling them, at the same time, that their enemies were no stronger than themselves, provided they would but lay aside their fears, and exert their ancient courage and resolution. That they might the better withstand the attacks of the enemy, he advised them to build a wall, not of turf, but of stone; offering to assist them with his soldiers, and to direct them himself in the execution. Upon this the Britons immediately fell to work; and with the assistance of the Romans, finished it in a short time, though it was no less than eight feet thick, and twelve feet in height. It is thought to have been built on the same place where Severus's wall formerly stood. Towers were also built at convenient

England.

24
Implore the assistance of the Romans.

25
Send ambassadors a second time to Rome.

England.

26
Britain fi-
nally aban-
doned by
the Ro-
mans.

venient distances on the east coast, to prevent the de-
scents of the Saxons and other barbarians that came
from Germany. Gallio employed the rest of his time
in teaching the provincials the art of war. He left
them patterns of the Roman weapons, which he also
taught them to make; and after many encouraging
exhortations, he took his last farewell of Britain, to
which the Romans never returned. There is a great
disagreement among chronologers as to the year in
which the Romans finally abandoned Britain; some
placing it in 422; others in 423, or 426; and some
in 431, 435, or 437.

27
Britons mi-
serably ha-
rassed by
the Scots
and Picts.28
Implore the
assistance of
the Ro-
mans.

The final departure of the Romans was no sooner
known to the Scots and Picts, than they poured in
upon the provincial Britons from all quarters, like hun-
gry wolves breaking into a sheep-fold. When the Scots
approached the new built-wall, they found it complete-
ly finished, and guarded by great numbers of armed
men. But so little had the provincial Britons profited
by the military instructions of the Romans, that in-
stead of placing proper guards and centinels, and re-
lieving one another by turns, their whole number had
staid several days and nights upon the ramparts with-
out intermission. Being therefore quite benumbed and
wearied out, they were able to make but very little
resistance. Many were pulled down with hooks from
the battlements, and dashed in pieces. The rest were
driven from their stations with showers of darts and
arrows. They betook themselves to flight; but that
could not save them. The Scots and Picts pursued
them close, made a dreadful havoc among the fugi-
tives, and took possession of the frontier towns, which
they found deserted by the inhabitants. As they now
met with no more opposition, they over-ran the whole
country, putting every thing to fire and sword. Their
ravages soon occasioned a famine; and this was follow-
ed by a kind of civil war. The provincials, unable to
support themselves, were obliged to plunder each other
of the little the common enemy had left them. The
whole country at last became so incapable of support-
ing those who were left in it, that many fled into the
woods, in order to subsist themselves there by hunting.
In this extremity of distress, they had once more re-
course to the Romans; and wrote in the most mourn-
ful style that can possibly be imagined to Aetius, who
was then consul the third time. Their letter they di-
rected thus: "The groans of the Britons to the con-
sul Aetius." The contents of this letter were answer-
able to the direction. "The barbarians (say they)
drive us to the sea; the sea drives us back to the bar-
barians; between which we have only the choice of
two deaths, either to be swallowed up by the waves,
or to be cruelly massacred by the enemy."

29
They at last
repulse
their ene-
mies.

To this letter the Roman general gave no satisfac-
tory answer, and the provincials were thereupon reduced
to despair. Great numbers of them fled over to Ar-
morica, where they settled along with others who had
formerly gone over with an usurper called *Maximus*;
while others submitted to the Scots and Picts. Some,
however, more resolute than the rest, had once more
recourse to arms. They sallied out in parties from the
woods and caves where they had been obliged to hide
themselves, and, falling unexpectedly on the enemy,
cut great numbers of them in pieces, and obliged the
rest to retire. Having thus obtained some respite,

they began again to cultivate their lands; which, ha-
ving lain fallow for a long time, now produced all
sorts of corn in the greatest plenty. This plenty, ac-
cording to the historian Gildas, occasioned the most
consummate wickedness and corruption of manners
among all ranks of men. The clergy, says he, who
should have reclaimed the laity by their example,
proved the ringleaders in every vice; being addicted to
drunkenness, contention, envy, &c.—It is possible, how-
ever, that this description might be exaggerated by
Gildas, who was himself a monk. But however this
was, the Britons had not long enjoyed peace, when
they were alarmed by a report, that the Scots and
Picts were about to return with a far greater force
than before, utterly to extirpate the name of their
southern neighbours, and seize upon the country for
themselves. This report threw them into a terrible
consternation; and to add to the rest of their misfor-
tunes, they were now visited by a dreadful plague,
which raged with such violence, that the living were
scarce sufficient to bury the dead. The contagion no
sooner ceased, than they found their country invaded
by the Scots and Picts, who destroyed every thing with
fire and sword; so that the provincials were soon re-
duced to the same miserable state they had formerly
been in.

At this time the chief, if not the only, king of the
southern division of Britain, was one *Vortigern*. He
is said to have been a cruel, debauched tyrant, regard-
less of the public welfare, and totally incapable of pro-
moting it. Being now roused from his sensibility,
however, by a sense of his own danger, he summoned
a council of the chief men of the nation, in order to
deliberate about the proper means for delivering the
country from those calamities under which it groaned.
In this council the most pernicious measure was adop-
ted that could possibly have been resolved on; namely,
to invite to their assistance the *Saxons*, a people famous
for their piracies and cruelty, and justly dreaded by
the Britons themselves*. This fatal expedient be-
ing agreed upon, ambassadors were immediately dis-
patched into Germany with advantageous proposals to
the Saxons in case they would come over to their as-
sistance.

The British ambassadors soon arrived in Germany,
and, according to Witichind, a Saxon historian of the
ninth century, made the following speech before an as-
sembly of the Saxons.—"Illustrious Saxons, the fame
of your victories having reached our ears, the distress-
ed Britons, harassed by the continual inroads of a
neighbouring enemy, send us to implore your assist-
ance. We have a fertile and spacious country, which
we are commanded to submit to you. We have hi-
therto lived under the protection of the Roman em-
pire; but our ancient masters having abandoned us,
we know no nation more powerful than you, and bet-
ter able to protect us. We therefore recur to your
valour. Forsake us not in our distress, and we shall
readily submit to what terms you yourselves shall think
fit to prescribe to us."—If this abject and shameful
speech was really made, it must give us a very strange
idea of the national spirit of the provincial Britons at
that time. It is, however, probable that the whole is
a fiction, designed only to excuse the perfidious treat-
ment which these Britons afterwards received from the
Saxons.

30
Are again
threatened
with an in-
vasion.31
They re-
solve to call
in the Sax-
ons.
* See Sax-

England. Saxons. The most respectable even of the Saxon historians make no mention of such a speech; and it is certain, that when the Saxons themselves wanted to quarrel with the Britons, they never insisted upon the promise made by the British ambassadors; which they most certainly would have done, had any such promise ever been made.

The British ambassadors were very favourably received by the Saxons. The latter embraced their proposal with joy; and the rather, because their soothsayers foretold that they should plunder their British allies for 150 years, and reign over them for twice that time. Three long ships, in the Saxon language called *chiules*, were therefore fitted out, under the conduct of Hengist and Horfa. These were two brothers much celebrated both for their valour and nobility. They were sons of Witigifil, said to be great-grandson to the Saxon god Woden; a circumstance which added much to their authority. Having embarked about 1600 men on board their three vessels, the two brothers arrived in the isle of Thanet, in the year 449 or 450.

³² The Saxons arrive in Britain, and defeat the Scots and Picts. They were received by the inhabitants with the greatest demonstrations of joy: the isle in which they had landed was immediately appointed for their habitation; and a league was concluded, in virtue of which the Saxons were to defend the provincial Britons against all foreign enemies; and the provincials were to allow the Saxons pay and maintenance, besides the place allotted them for their abode. Soon after their arrival, king Vortigern led them against the northern nations who had lately broke into the kingdom, and advanced as far as Stanford in the county of Lincolnshire. Here a battle was fought, in which the Scots and Picts were utterly defeated, and obliged to relinquish their booty.

Vortigern was so highly pleased with the behaviour of his new allies, that he bestowed large possessions in the country they had newly delivered, upon the two commanders Hengist and Horfa. It is said, that, even at this time, Hengist was taken with the wealth and fertility of the country; and at the same time observing the inhabitants to be quite enervated with luxury, began to entertain hopes of conquering part of it. He therefore, with Vortigern's consent, invited over some more of his countrymen; giving them notice at the same time of the fruitfulness of the country, the effeminacy of the inhabitants, and how easily a conquest might be effected.

³³ New supplies of Saxons arrive. The Saxons readily complied with the invitation; and, in 452, as many more arrived in 17 vessels, as with those already in Britain, made up an army of 5000 men. Along with these, according to Nennius, came over Rowena the daughter of Hengist. Vortigern fell in love with this lady; and in order to obtain her in marriage, divorced his lawful wife. Hengist pretended to be averse to the match; but Vortigern obtained his consent by investing him with the sovereignty of Kent. The Saxon historians, indeed, make no mention of Rowena; but rather insinuate, that their countrymen made themselves masters of Kent by force of arms. It seems most probable, however, that Vortigern had as yet continued in friendship with the Saxons, and even put more confidence in them than in his own subjects. For, not long after the arrival of this first reinforcement, Hengist obtained leave

to fend for a second, in order, as was pretended, to defend the king from the attempts of his rebellious subjects, as well as of the Scots and Picts. These embarked in 40 ships, under the command of Oeta and Ebusa, the son and nephew, or, according to some, the brother and nephew of Hengist. They landed at the Orkney islands; and having ravaged them, as well as all the northern coasts of Scotland, they conquered several places beyond the Frith, and at last obtained leave to settle in Northumberland.

The pretence made for this settlement was, that the Saxons under Oeta and Ebusa might defend the northern frontiers of the kingdom, as those under Hengist and Horfa did the southern parts. Many more Saxons were, under various pretences, invited over; till at last the countries from which they came were in a manner depopulated. And now their numbers being greatly increased, the Saxons began to quarrel with the natives. They demanded larger allowances of corn, and other provisions; threatening to lay waste the whole country if their demands were not complied with. ³⁴ They quarrel with the Britons. The Britons, instead of complying with these demands, desired them to return home, since their numbers exceeded what they were able to maintain. Upon this, the Saxons concluded a peace with the Scots and Picts; and, turning their arms against the unhappy provincials, over-ran the whole country. The Saxons committed every where the greatest cruelties. All buildings, whether public or private, they levelled with the ground. The cities were pillaged and burnt; and the people massacred without distinction of sex or age, and that in such numbers, that the living scarce sufficed to bury the dead. Some of those who escaped the general slaughter, took refuge among inaccessible rocks and mountains; but there great numbers perished with hunger, or were forced to surrender themselves as slaves to their enemies. Some crossed the sea and settled either in Holland or in Armorica, now the province of Brittany in France.

Vortigern, we are told by Nennius, was so far from being reclaimed by these calamities, that he added incest to his other crimes, and married his own daughter. At last, his own subjects, provoked at his enormous wickedness, and the partiality he showed to the Saxons, deposed him, and raised his son Vortimer to the throne. ³⁵ They are defeated and driven out by Vortimer. He was a young man of great valour, and willingly undertook the defence of his distressed country. He first fell upon the Saxons with what troops he could assemble, and drove them into the isle of Thanet. Here they were besieged, till, being reinforced by fresh supplies from Germany, they opened themselves a way through the British troops. Vortimer, however, was not yet disheartened. He engaged the Saxons on the banks of the Derwent in Kent, where he obtained a complete victory, and cut in pieces great numbers of the enemy. Another battle was fought at Aylesford in Kent. Some ascribe the victory at this time to the Saxons, and some to the Britons. It is certain, however, that Horfa the brother of Hengist was killed in this engagement. He is said to have been buried at a place in the neighbourhood, which from him obtained the name of *Horsted*.—A third battle was fought, in which the victory was uncertain, as is also the place where it happened. The fourth battle, however, according to Nennius, proved decisive

England.

decisive in favour of the Britons. Vortimer engaged his enemies, according to some, at Folkestone; according to others, at a place called *Stonar*, in the isle of Thanet. The Saxons were defeated with great slaughter, and driven back to their ships. So complete is this victory said to have been, that the Saxons quitted the island, without making any attempt upon it for five years afterwards. These battles, however, rest entirely upon the credit of Nennius, and the historians who have followed him. They are taken notice of neither by Gildas nor Bede. The former only acquaints us, that the Saxons retired. This, by most historians, is understood of their returning home; tho' it is possible he might mean no more, than that, after they had laid waste the country, they retired into the territories allotted them by Vortigern, in Kent and Northumberland.

36 They re-
turn and
defeat the
Britons,
and erect
a kingdom
in Kent.
Vortimer is said to have died after a reign of six years. On his death-bed, he desired his servants to bury him near the place where the Saxons used to land; being persuaded, that the virtue of his bones would effectually prevent them from ever touching the British shore. This command, however, was neglected; and Vortimer was buried at Lincoln, according to some, or London, according to others. Hengist was no sooner informed of his death, than he invaded Britain anew with a numerous body of Saxons. He was opposed by Vortigern, who had been restored to the throne after the death of his son Vortimer. Several battles were fought on this occasion; but at last the provincials being overthrown at a place called *Crecanford*, with the loss of 4000 men, were obliged to abandon Kent to their enemies, and retire to London. This happened about the year 458 or 459; and from this time most historians date the erection of the first Saxon kingdom in Britain, viz. that of Kent. Hengist assumed the title of *king*, and chose Eik his son for his colleague.

37 Treachery
of the Sax-
ons.
The Britons under Vortigern still continued the war. Hengist finding himself unable to gain a decisive advantage over them in the field, had recourse to treachery. He pretended to be desirous of concluding a peace with the British monarch, and of renewing his ancient friendship with him; and therefore required an interview. To this Vortigern readily consented, and accepted of an entertainment prepared for him by Hengist. The king was attended by 300 nobility all unarmed, but the Saxons had concealed daggers below their garments. The British nobility were all treacherously massacred in the height of their mirth; Vortigern himself was taken and put in fetters; nor could his liberty be procured, but by ceding to the Saxons those provinces now called *Essex*, *Sussex*, and *Middlesex*. Thus the Saxons got such a footing in Britain that they could never afterwards be expelled. Vortigern, after being set at liberty, is said to have retired to a vast wilderness near the fall of the Wye in Radnorshire, where he was some time after consumed by lightning, together with a city called *Kaer Gourtigern* which he had built in that place.

On the retreat of Vortigern, the command of the British forces devolved upon Aurelius Ambrosius, or, as Gildas calls him, Ambrosius Aurelianus. He was a Roman, and perhaps the last that remained in the island. He is said to have gained several victories over the

N^o 115.

Saxons. Notwithstanding this, however, they still continued to gain ground; and in the year 491, the foundation of a second Saxon kingdom was laid in Britain. This at first comprehended only the county of *Sussex*, but soon after extended over most of the countries lying south of the Humber. It was called the *kingdom of the South Saxons*.

The German nations being now informed of the good success which had attended the Saxons in Britain, new adventurers daily flocked over to share the good fortune of the others. They were chiefly composed of three nations, the Saxons, Angles, and Jutes. All these passed under the common appellation sometimes of *Saxons*, sometimes of *Angles*. They spoke the same language, and agreed very much in their customs and institutions, so that all of them were naturally led to combine against the natives. The most active of these adventurers was Cerdic a Saxon, said to be the tenth in descent from Woden. He landed with his son Cenric, and as many men as he could convey in five ships, at Yarmouth in Norfolk. The provincials immediately attacked him with great vigour; but after a short engagement, they were totally defeated. Many other battles were fought, the event of which was always favourable to the Saxons, so that the Britons were forced to abandon their sea-coasts to them.

In 497, *Porta*, another Saxon, with his two sons *Bleda* and *Magla*, arrived at *Portsmouth*, so called, as some imagine, from this chieftain. The provincials, under the command of a young prince a native of the country, attempted to oppose the landing of the Saxons: but his army was defeated with great slaughter, and he himself killed in the engagement; after which *Porta* made himself master of all the neighbouring country. The progress of Cerdic, however, alarmed the Britons more than that of all the other Saxon princes. About the year 508, therefore, *Nazaleod*, styled, by Henry of Huntingdon, the *greatest of all the British kings*, assembled almost the whole strength of the provincial Britons in order to drive him out of the island. Cerdic on the other hand took care to strengthen himself by procuring assistance from all the Saxons already in the island. He then advanced against the Britons, commanding the right wing himself, and his son Cenric the left. As the two armies drew near each other, *Nazaleod* perceived the enemy's right wing to be much stronger than the left. He therefore attacked it with the flower of his army; and after an obstinate resistance, obliged Cerdic to save himself by flight. Being too eager in the pursuit, however, Cenric fell upon his rear, and the battle was renewed with great vigour. The British army was at last entirely defeated; and 5000 men, among whom was *Nazaleod* himself, were left dead on the spot.

Who succeeded *Nazaleod* in the kingdom of Britain, is not known. The Welsh annals leave an interregnum of about six years; after which they place the beginning of the reign of Arthur, the most renowned British prince mentioned in history. The history of king Arthur is so much obscured by fables, and many absurd, romantic, and ridiculous stories, that some have supposed that no such person ever existed. On this subject Milton gives the following reasons against the existence of king Arthur: 1. He is not mentioned by Gildas,

England.

38
Second Sax-
on king-
dom.

39
Nazaleod
king of
Britain de-
feated and
killed.

40
Whether
such a per-
son as king
Arthur e-
ver existed.

England. Gildas, or any British historian except Nennius, who is allowed on all hands to have been a very credulous writer, and to have published a great many fables. 2. Though William of Malmesbury and Henry of Huntingdon have both related his exploits, yet the latter took all he wrote from Nennius; and the former, either from the same fabulous writer, or some Monkish legends in the abbey of Glastenbury; for both these writers flourished several centuries after king Arthur. 3. In the pretended history of Geoffroy of Monmouth, such contradictions occur concerning this monarch's victories in France, Scotland, Ireland, Norway, Italy, &c. as must cause us to look upon him as an hero altogether fabulous and romantic.

In answer to this it has been said, 1. That his not being mentioned by Gildas cannot seem strange to us, seeing it was not that author's design to write an exact history of his country, but only to give a short account of the causes of its ruin by the Scots, Picts, and Saxons. He had also a particular system to support, namely, That the ruin of the Britons was owing to the judgments of God upon them for their wickedness. He lies therefore under a great temptation to conceal the successes of the Britons, and to relate only their misfortunes. 2. Though Nennius was a credulous writer, it is unreasonable to think that the whole history of king Arthur was an invention of his. It is more probable that he copied it from other more ancient authors, or took it from the common tradition of his countrymen. That the Saxon annals make no mention of this king is not to be wondered at, seeing it is natural to think that they would wish to conceal the many defeats he gave their nation. 3. The most convincing proof of the existence of king Arthur is, that his tomb was discovered at Glastenbury in Somersetshire, and his coffin dug up, in the reign of Henry II. with the following inscription upon it in Gothic characters: "Hic jacet sepultus inclytus rex Arturius in insula Avalonia." We are told that on his body were plainly to be seen the marks of 10 wounds, only one of which seemed to be mortal.

41
His ex-
ploits.

This renowned prince is said to have defeated the Saxons under Cerdic in 12 pitched battles. The last of these was fought on Badon-hill, supposed to be Bamsdown near Bath; in which the Saxons received such a terrible overthrow, that for many years they gave the Britons no further molestation. As new supplies of Saxons, however, were continually flocking over, a third and fourth kingdom of them were soon formed. The third kingdom comprehended the counties of Devon, Dorset, Somerset, Wiltshire, Hampshire, and Berkshire; to which was afterwards added Cornwall. This was called the *kingdom of the West Saxons*. The other kingdom, which was called the *kingdom of the East Saxons*, comprehended Essex, Middlesex, and part of Hertfordshire.

42
Five other
Saxon king-
doms erected.

In the year 542, happened the death of the great king Arthur, said to have been killed in battle with a treacherous kinsman of his own. Five years afterwards, was erected the Saxon kingdom of Northumberland. It extended, however, much farther than the present bounds of that country; for it comprehended all Yorkshire, Lancashire, Durham, Cumberland, Westmoreland, and Northumberland, with part of Scotland, as far as the frith of Forth. Between these Saxon,

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England. kings frequent contentions now arose; by which means the Britons enjoyed an uninterrupted tranquillity for at least 44 years. This interval, however, according to Gildas, they employed only in corrupting their manners more and more, till at last they were roused from their security by the setting up of a sixth Saxon kingdom, called the kingdom of the *East Angles*. It was founded in 575, and comprehended the counties of Norfolk, Suffolk, Cambridgeshire, and the Isle of Ely. The Saxons once more attacked the Britons, and overthrew them in many battles. The war was continued for ten years; after which, another Saxon kingdom called *Mercia* was set up. It comprehended 17 counties; viz. Gloucester, Hereford, Worcester, Warwick, Leicester, Rutland, Northampton, Lincoln, Huntingdon, Bedford, Buckingham, Oxford, Stafford, Nottingham, Derby, Shropshire, Cheshire, and part of Hertfordshire.

The provincial Britons were now confined within very narrow bounds. However, before they entirely gave up the best part of their country to their enemies, they once more resolved to try the event of a battle. At this time they were assisted by the Angles, who were jealous of the overgrown power of the West Saxons. The battle was fought in Wiltshire, at Woden's Bearth, a place near the ditch called *Wansdike* or *Wodensdike*; which runs through the middle of the county. The battle was very obstinate and bloody; but at last the Saxons were entirely defeated, and almost their whole army cut off. The victory, however, proved of little service to the Britons: for being greatly inferior in number to the Saxons, and harassed by them on the one side, and by the Scots and Picts on the other, they were daily more and more confined; and at last obliged to take refuge among the craggy and mountainous places in the west of the island, where their enemies could not pursue them. At first they possessed all the country beyond the rivers Dee and Severn, which anciently divided Cambria, or Wales, from England; the towns which stand on the eastern banks of these rivers having mostly been built in order to restrain the incursions of the Welsh. But the English, having passed the Severn, by degrees seized on the country lying between that river and the Wye. Nay, in former time, some parts of Flintshire and Denbighshire were subject to the kings of Mercia: for Uffa, the most powerful king of that country, caused a deep ditch to be drawn, and a high wall built, as a barrier between his dominions and the territories of the Welsh, from the mouth of the Dee, a little above Flint-castle, to the mouth of the Wye. This ditch is still to be seen in several places; and is called by the Welsh *Claudh Uffa*, or the Ditch of Uffa. The inhabitants of the towns on the east side of this ditch are called by the same people *Guyr y Mers*; that is, the men of Mercia.

43

The Britons
defeat the
Saxons, but
are obliged
to retire in-
to Wales.

Thus, after a violent contest of near 150 years, the Saxons entirely subdued the Britons whom they had come to defend, and had erected seven independent kingdoms in England, now commonly denominated the *Saxon Heptarchy*. By these conquerors the country was now reduced to a degree of barbarity almost as great as it had been in when first invaded by the Romans. The provincial Britons, during their subjection to that people, had made considerable advances in civilization.

44

Account of
the heptar-
chy.

England. vilization. They had built 28 considerable cities, besides a number of villages and country-seats; but now these were all levelled with the ground, the native inhabitants who remained in England were reduced to the most abject slavery, and every art and science totally extinguished among them.

Before these fierce conquerors could be civilized in any degree, it was necessary that all the seven kingdoms should be reduced under one head; for as long as they remained independent, their continual wars with each other still kept them in the same state of barbarity and ignorance.

The history of these seven kingdoms affords no event that can be in the least interesting. It consists only of a detail of their quarrels for the sovereignty. This was at last obtained by Egbert king of the West Saxons, or Wessex, in 827. Before this time, Christianity had been introduced into almost all the kingdoms of the heptarchy; and however much corrupted it might be by coming through the impure channel of the church of Rome, and misunderstood through the ignorance of those who received it, it had considerably softened the barbarous manners of the Saxons. It had also opened a communication between Britain and the more polite parts of Europe, so that there was now some hope of the introduction of arts and sciences into this country. Another effect was, that, by the ridiculous notions of preserving inviolable chastity even between married people, the royal families of most of the kingdoms were totally extinct; and the people, being in a state of anarchy, were ready to submit to the first who assumed any authority over them.

All these things contributed to the success of Egbert in uniting the heptarchy under his own dominion. He was of the royal family of Wessex; and a nearer heir than Brithric, who had been raised to the kingdom in 784. As Egbert was a prince of great accomplishments, Brithric, knowing that he had a better title to the crown than himself, began to look upon him with a very jealous eye. Young Egbert, sensible of his danger, privately withdrew to France; where he was well received by Charlemagne, the reigning monarch. The French were reckoned at this period the most valiant and polite people in Europe; so that this exile proved of great service to Egbert.

He continued at the court of France till he was recalled by the nobility to take possession of the kingdom of Wessex. This recall was occasioned by the following accident. Brithric the king of Wessex had married Eadburga, natural daughter of Offa king of Mercia; a woman infamous for cruelty and incontinence. Having great influence over her husband, she often persuaded him to destroy such of the nobility as were obnoxious to her; and where this expedient failed, she herself had not scrupled to become their executioner. She had mixed a cup of poison for a young nobleman, who had acquired a great share of her husband's friendship: but, unfortunately, the king drank of the fatal potion along with his favourite, and soon after expired. By this and other crimes Eadburga became so odious to the people, that she was forced to fly into France, whence Egbert was at the same time recalled, as above mentioned.

Egbert ascended the throne of Wessex in the year

799. He was the sole descendant of those conquerors England. who first invaded Britain, and who derived their pedigree from the god Woden. But though this circumstance might have given him great advantages in attempting to subdue the neighbouring kingdoms, Egbert for some time gave them no disturbance; but turned his arms against the Britons, who had retired into Cornwall, whom he defeated in several battles. He was recalled from his conquests in that country, by hearing that Bernulf king of Mercia had invaded his dominions. Egbert quickly led his army against the invaders, whom he totally defeated at Ellendun in Wiltshire. He then entered their kingdom on the side of Oxfordshire with an army, and at the same time sent his eldest son Ethelwolf with another into Kent. The young prince expelled Baldred the tributary king of Kent, and soon made himself master of the country. The kingdom of Essex was conquered with equal ease; and the East Angles, who had been reduced under subjection by the Mercians, joyfully put themselves under the protection of Egbert. Bernulf himself marched against them, but was defeated and killed; and Ludecan his successor met with the same fate two years after.

These misfortunes greatly facilitated the reduction of Mercia. Egbert soon penetrated into the very heart of the Mercian territories, and gained an easy victory over a dispirited and divided people; but in order to engage them to submit with the less reluctance, he allowed Wiglaf, their countryman, to retain the title of king, whilst he himself exercised the real power of a sovereign. Northumberland was at present in a state of anarchy: and this tempted Egbert to carry his victorious arms into that kingdom also. The inhabitants, being desirous of living under a settled form of government, readily submitted, and owned him for their sovereign. To them, however, he likewise allowed the power of electing a king; who paid him a tribute, and was dependent on him.

Egbert became sole master of England about the ⁴⁵ year 827. A favourite opportunity was now offered ^{Egbert the first king of} to the Anglo-Saxons of becoming a civilized people, ^{England.} as they were at peace among themselves, and seemed free from any danger of a foreign invasion. But this flattering prospect was soon overcast. Five years after Egbert had established his new monarchy, the Danes landed in the isle of Shepey, plundered it, and then ⁴⁶ made their escape with safety. Encouraged by this ^{Danish in-} success, next year they landed from a fleet of 35 ships. ^{vasion.} They were encountered by Egbert at Charmouth in Dorsetshire. The battle was obstinate and bloody. Great numbers of the Danes were killed, but the rest made good their retreat to their ships. They next entered into an alliance with the Britons of Cornwall; and landing two years after in that country, they made an irruption into Devonshire. Egbert met them at Hengedown, and totally defeated them; but before he had time to form any regular plan for the defence of the kingdom, he died, and left the government to his son Ethelwolf.

The new king was weak and superstitious. He began with dividing the kingdom, which had so lately been united, with his son Athelstan. To the young prince he gave the counties of Essex, Kent, and Sussex. But though this division might have been productive ⁴⁷ of ^{Ethelwolf's}

England. of bad consequences at another time, the fear of the Danes kept every thing quiet for the present. These barbarians had some how or other conceived such hopes of enriching themselves by the plunder of England, that they scarce ever failed of paying it an annual visit. The English historians tell us, that they met with many severe repulses and defeats; but on the whole it appears that they had gained ground: for in 851 a body of them took up their winter-quarters in England. Next year they received a strong reinforcement of their countrymen in 350 vessels; and advancing from the isle of Thanet, where they had stationed themselves, they burnt the cities of London and Canterbury. Having next put to flight Brictric the governor of Mercia, they marched into the heart of Surrey, laying waste the whole country through which they passed.

Ethelwolf, though naturally little fitted for military enterprises, was now obliged to take the field. He marched against the Danes at the head of the West Saxons, and gained an indecisive and bloody victory over his enemies. The Danes still maintained their settlement in the isle of Thanet. They were attacked by Ealher and Huda, governors of Kent and Surry; both of whom they defeated and killed. Afterwards they removed to the isle of Shepey, where they took up their winter-quarters, with a design to extend their ravages the next year.

The deplorable state of the kingdom did not hinder Ethelwolf from making a pilgrimage to Rome, whither he carried his fourth and favourite son Alfred, then only six years of age. He passed a twelvemonth in that city; made presents to the principal ecclesiastics there; and made a grant of 300 mancuses (a silver coin about the weight of our half-crown) annually to the see of Rome. One-third of this was to support the lamps of St Peter's, another those of St Paul's, and the third was for the Pope himself. In his return to England, Ethelwolf married Judith, daughter of the emperor Charles the Bald; but when he landed, he found himself deprived of his kingdom by his son Ethelbald. That prince assumed the government of Athelstan's dominions, who was lately dead; and, with many of Ethelwolf's nobles, formed a design of excluding him from the throne altogether, on account of his weaknesses and superstitions. Ethelwolf, however, delivered the people from the calamities of a civil war, by dividing the kingdom with his son. He gave to Ethelbald the government of the western, and reserved to himself that of the eastern part of the kingdom. Immediately after this, he summoned the states of the whole kingdom, and conferred on the clergy a perpetual donation of tythes, for which they had long contended, and which had been the subject of their sermons for several centuries.

This concession was deemed so meritorious by the English, that they now thought themselves sure of the favour of heaven; and therefore neglected to use the natural means for their safety which they might have done. They even agreed, that, notwithstanding the desperate situation of affairs at present, the revenues of the church should be exempted from all burdens, though imposed for the immediate security and defence of the nation. Ethelwolf died two years after he had made the above mentioned grant, and left the

kingdom to his two eldest sons Ethelbald and Ethelbert. Both these princes died in a few years, and left the kingdom to Ethered their brother, in the year 866. England.

48
Ethered. The whole course of Ethered's reign was disturbed by the irruptions of the Danes. The king defended himself against them with great bravery, being seconded in all his military enterprises by his younger brother Alfred, who afterwards ascended the throne. In this reign, the Danes first landed among the East Angles. That people treacherously entered into an alliance with the common enemy; and furnished them with horses, which enabled them to make an irruption into Northumberland. There they seized upon the city of York. Osbriht and Ælla, two Northumbrian princes who attempted to rescue the city, were defeated and killed. Encouraged by this success, the Danes penetrated into the kingdom of Mercia, took up their winter-quarters at Nottingham, and thus threatened the kingdom with a final subjection. From this post, however, they were dislodged by Ethered and Alfred, who forced them to retire into Northumberland. Their restless and savage disposition, however, did not suffer them to continue long in one place. They broke into East Anglia; defeated and took prisoner Edmund the tributary king of that country, whom they afterwards murdered; and committed every where the most barbarous ravages. In 871, they advanced to Reading; from whence they infested the neighbouring country by their incursions. The Mercians, desirous of recovering their independency, refused to join Ethered with their forces; so that he was obliged to march against the Danes, attended only by the West Saxons, who were his hereditary subjects. Several actions ensued, in which the Danes are said to have been unsuccessful; but being continually reinforced from their own country, they became every day more and more formidable to the English. During the confusion and distress in which the nation was now necessarily involved, king Ethered died of a wound he had received in an action with the Danes; and left to his brother Alfred the kingdom almost totally subdued by a foreign power.

49
Alfred the Great. Alfred, who may properly be called the founder of the English monarchy, ascended the throne in the year 871, being then only 22 years of age. His great virtues and shining talents saved his country from ruin, which seemed almost unavoidable. His exploits against the Danes, his dangers and distresses, are related under the article ALFRED. Having settled the nation in a much better manner than could have been expected, he died in 901, leaving the kingdom to his second son Edward the Elder.

50
Edward the Elder. The beginning of this monarch's reign was disturbed by those intestine commotions from which the wise and politic Alfred had taken so much pains to free the nation. Ethelwald, son to king Ethelbert, Alfred's elder brother, claimed a right to the throne. Having armed his partisans, he took possession of Winburne, where he seemed determined to hold out to the last extremity. On the approach of Edward, however, with a powerful army, he first fled into Normandy, and afterwards into Northumberland. He hoped to find the Northumbrians ready to join him, as most of them were Danes, lately subdued by Alfred, and very impatient of peace. The event did not disappoint his expectations.

England. expectations. The Northumbrians declared for him; and Ethelwald having thus connected himself with the Danish tribes, went beyond sea, whence he returned with a great body of these banditti. On his return, he was joined by the Danes of East Anglia and Mercia. Ethelwald, at the head of the rebels, made an irruption into the counties of Gloucester, Oxford, and Wilts; and having ravaged the country, retired with his booty before the king could approach him. Edward, however, took care to revenge himself, by conducting his forces into East Anglia, and ravaging it in like manner. He then gave orders to retire; but the Kentish men, greedy of more plunder, staid behind, and took up their quarters at Bury. Here they were assaulted by the Danes; but the Kentishmen made such an obstinate defence, that though their enemies gained the victory, it was bought by the loss of their bravest men, and, among the rest, of the usurper Ethelwald himself.

The king, now freed from the attempts of so dangerous a rival, concluded an advantageous peace with the East Angles. He next set about reducing the Northumbrians; and for this purpose equipped a fleet, hoping that thus they would be induced to remain at home to defend their own country, without attempting to invade his territories. He was disappointed in his expectations. The Northumbrians were more eager to plunder their neighbours than to secure themselves. Imagining that the whole of Edward's forces were embarked on board his fleet, they entered his territories with all the troops they could raise. The king, however, was better prepared for them than they had expected. He attacked them on their return at Tetenhall in the county of Stafford, put them to flight, recovered all the booty, and pursued them with great slaughter into their own country.

The rest of Edward's reign was a scene of continued and successful action against the Northumbrians, East Angles, the Danes of Mercia, and those who came from their native country in order to invade England. He put his kingdom in a good posture of defence, by fortifying the towns of Chester, Eddesbury, Warwick, Cherbury, Buckingham, Towcester, Maldon, Huntingdon, and Colchester. He vanquished Thurketill a Danish chieftan, and obliged him to retire with his followers into France. He subdued the East Anglians, Northumbrians, and several tribes of the Britons; and even obliged the Scots to make submissions. He died in 925, and was succeeded by Athelstan his natural son.

⁵¹
Athelstan.

This prince, notwithstanding his illegitimate birth, ascended the throne without much opposition, as the legitimate children of Edward were too young to rule a nation so much liable both to foreign invasions and domestic troubles as England at present was. One Alfred, however, a nobleman of considerable power, entered into a conspiracy against him. It is said, that this nobleman was seized upon strong suspicions, but without any certain proof. He offered to swear to his innocence before the pope; and in those ages it was supposed that none could take a false oath in presence of such a sacred person, without being visited by an immediate judgment from God. Alfred was accordingly conducted to Rome, and took the oath required of him before Pope John. The words were no sooner

pronounced, than he fell into convulsions, of which he expired in three days. The king, fully convinced of his guilt, confiscated his estate, and made a present of it to the monastery of Malmesbury.

This accident proved the means of establishing the authority of Athelstan in England. But finding the Northumbrians bore the English yoke with impatience, he gave Sithric, a Danish nobleman, the title of king of Northumberland; and in order to secure his friendship, gave him his own sister Editha in marriage. This was productive of bad consequences. Sithric died the year after his marriage with Editha; upon which Anlaf and Godfrid, Sithric's sons by a former marriage, assumed the sovereignty without waiting for Athelstan's consent. They were, however, soon obliged to yield to the superior power of that monarch. The former fled to Ireland; and the latter to Scotland, where he was protected by Constantine king of that country. The Scottish monarch was continually importuned by Athelstan to deliver up his guest, and even threatened with an invasion in case he did not comply. Constantine, detesting this treachery, advised Godfrid to make his escape. He did so, turned pirate, and died soon after. Athelstan, however, resenting this conduct of Constantine, invaded his kingdom, and reduced him, it is said, so low, that he was obliged to make the most humble submissions. This, however, is denied by all the Scottish historians.

Constantine, after the departure of Athelstan, entered into a confederacy with Anlaf, who subsisted by his piracies, and with some of the Welsh princes who were alarmed at the increase of Athelstan's power. All these confederates made an irruption into England at once; but Athelstan meeting them at Brumsbury in Northumberland, gave them a total overthrow. Anlaf and Constantine made their escape with difficulty, leaving the greatest part of their men dead on the field of battle. After this period, Athelstan enjoyed his crown in tranquillity. He died in 941, after a reign of 16 years. He passed a remarkable law, for the encouragement of commerce; viz. that a merchant, who had made three long sea-voyages on his own account, should be admitted to the rank of a thane or gentleman.

⁵³
Edmund. Athelstan was succeeded by his brother Edmund. On his accession, he found the kingdom disturbed by the restless Northumbrians, who watched for every opportunity of rising in rebellion. They were, however, soon reduced; and Edmund took care to ensure the peace of the kingdom, by removing the Danes from the towns of Mercia where they had been allowed to settle, because it was found that they took every opportunity to introduce foreign Danes into the kingdom. He also conquered Cumberland from the Britons. This country, however, he bestowed upon Malcolm king of Scotland, upon condition that he should do homage for it, and protect the north of England from all future incursions of the Danes.

⁵⁴
Murdered. Edmund was unfortunately murdered in Gloucester, by one Leolf a notorious robber. This man had been by formerly sentenced to banishment; yet had the boldness to enter the hall where the king himself dined, and to sit at table with his attendants. Edmund immediately ordered him to leave the room. The villain refused to obey; upon which the king leaped upon him,

England. him, and seized him by the hair. Leolf then drew a dagger, and gave the king a wound, of which he instantly died, A. D. 946, being the sixth year of his reign.

55
Edred.

As the children of Edmund were too young at the time of his decease, his brother Edred succeeded to the throne. The beginning of his reign, as well as those of his predecessors, was disturbed by the rebellions and incursions of the Northumbrian Danes, who looked upon the succession of every new king to be a favourable opportunity for shaking off the English yoke. On the appearance of Edred with an army, however, they immediately submitted; but before the king withdrew his forces, he laid waste their territories as a punishment for their offence. He was no sooner gone, than they rose in rebellion a second time. They were again

56
Subdues the
Northum-
brians.

subdued; and the king took effectual precautions against their future revolts, by placing English garrisons in all their towns, and appointing an English governor to watch their motions, and suppress their insurrections on the first appearance. In the reign of Edred, celibacy of the clergy began to be preached up under the patronage of St DUNSTAN. This man had obtained such an ascendant over Edred, who was naturally superstitious, that he not only directed him in affairs of conscience, but in the most important matters of state. He was placed at the head of the treasury; and being thus possessed of great power at court, he was enabled to accomplish the most arduous undertakings. He professed himself a partisan of the rigid monastic rules; and having introduced celibacy among the monks of Glastenbury and Abingdon, he endeavoured to render it universal among the clergy throughout the kingdom. The monks in a short time generally embraced the pretended reformation; after which they inveighed bitterly against the vices and luxury of the age. When other topics of defamation were wanting, the marriages of clergymen became a sure object of invective. Their wives received the appellation of *concubines* or some other more opprobrious name. The secular clergy, on the other hand, who were numerous and rich, defended themselves with vigour, and endeavoured to retaliate upon their adversaries. The people were thrown into the most violent ferments; but the monks, being patronised by king Edred, gained ground greatly upon their opponents. Their progress, however, was somewhat retarded by the king's death, which happened in 955, after a reign of nine years. He left children; but as they were infants, his nephew Edwy, son to Edmund, was placed on the throne.

58
Edwy.

The new king was not above 16 or 17 years of age at the time of his accession. His reign is only remarkable for the tragical story of his queen Elgiva. She was a princess of the royal blood, with whom Edwy was deeply enamoured. She was his second or third cousin, and therefore within the degrees of affinity prohibited by the canon law. Edwy, however, hearkening only to the dictates of his passion, married her, contrary to the advice of the more dignified ecclesiastics. The monks on this occasion were particularly violent; and therefore Edwy determined not to second their ambitious projects. He soon found reason to repent his having provoked such dangerous enemies. On his coronation day, while his nobility were indulging them-

selves in riotous mirth in a great hall where they had assembled, Edwy withdrew to another apartment to enjoy the company of his beloved queen and her mother. Dunstan guessed the reason of his absence. With unparalleled impudence, he burst into the queen's apartment; and upbraiding Edwy with his lasciviousness, as he termed it, pushed him back to the hall where the nobles were assembled. The king determined to resent such a daring insult. He required from Dunstan an account of his administration of the treasury during the late reign. The monk, probably unable to give a just account, refused to give any; upon which Edwy accused him of malversation in his office, and banished him the kingdom.

This proved the worst step that could possibly have been taken. Dunstan was no sooner gone than the whole nation was in an uproar about his sanctity and the king's impiety. These clamours, as they had been begun by the clergy, so they were kept up and increased by them, till at last they proceeded to the most outrageous violence. Archbishop Odo sent a party of soldiers to the palace. They seized the queen, and burned her face with a red-hot iron, in order to destroy her beauty by which she had enticed her husband; after which they carried her by force into Ireland, there to remain in perpetual exile. The king, finding it in vain to resist, was obliged to consent to a divorce from her, which was pronounced by Archbishop Odo. A catastrophe still more dismal awaited Elgiva. She had been cured of her wounds, and had even found means to efface the scars with which her persecutors had hoped to destroy her beauty. She then came to England, with a design to return to the king, whom she still considered as her husband. Unfortunately, however, she was intercepted by a party of soldiers sent for that purpose by the primate. Nothing but her most cruel death could now satisfy that wretch and his accomplices. She was hamstrung at Gloucester, and expired in a few days.

59
Tragical
death of the
queen.

The minds of the English were at this time so much sunk in superstition, that the monstrous inhumanity above mentioned was called a judgment from God upon Edwy and his spouse for their dissolute life, *i. e.* their love to each other. They even proceeded to rebellion against their sovereign; and having raised to the throne Edgar, the younger brother of Edwy, at that time only 13 years of age, they soon put him in possession of Mercia, Northumberland, and East Anglia. Edwy being thus confined to the southern counties, Dunstan returned, and took upon him the government of Edgar and his party; but the death of Edwy soon removed all difficulties, and gave Edgar peaceable possession of the government.

The reign of Edgar proved one of the most fortunate mentioned in the ancient English history. He took the most effectual methods both for preventing tumults at home and invasions from abroad. He quartered a body of disciplined troops in the north, in order to repel the incursions of the Scots, and to keep the Northumbrians in awe. He built a powerful navy; and that he might keep the seamen in the practice of their duty, as well as present a formidable armament to his enemies, he commanded the fleet from time to time, to make the circuit of his dominions.

60
Edgar.

The

Eng'land.

The greatness of king Edgar, which is very much celebrated by the English historians, was owing to the harmony which reigned between him and his subjects; and the reason of this good agreement was, that the king sided with Dunstan and the monks, who had acquired a great ascendant over the people. He enabled them to accomplish their favourite scheme of dispossessing the secular canons of all the monasteries; and he consulted them not only in ecclesiastical, but also in civil affairs. On these accounts, he is celebrated by the monkish writers with the highest praises; though it is plain, from some of his actions, that he was a man who could be bound neither by the ties of religion nor humanity. He broke into a convent, and carried off by force, and ravished, a nun called *Editha*. His spiritual instructor, Dunstan, for this offence, obliged the king, not to separate from his mistress, but to abstain from wearing his crown for seven years!

61
His licentious
amours

Edgar, however, was not to be satisfied with one mistress. He happened once to lodge at the house of a nobleman who had a very beautiful daughter. Edgar, enflamed with desire at the sight of the young lady, without ceremony asked her mother to allow her to pass a night with him. She promised compliance; but secretly ordered a waiting-maid, named *Elfreda*, to steal into the king's bed when the company were gone, and to retire before day-break. Edgar, however, detained her by force, till day-light discovered the deceit. His love was now transferred to the waiting-maid; who became his favourite mistress, and maintained a great ascendant over him till his marriage with *Elfrida*.

62
His marriage with
Elfrida.

The circumstances of this marriage were still more singular and criminal than those above mentioned. *Elfrida* was daughter and heiress to *Olga* Earl of Devonshire. She was a person of such exquisite beauty, that her fame was spread all over England, though she had never been at court. Edgar's curiosity was excited by the accounts he had heard of her, and therefore formed a design of marrying her. He communicated his intention to *Earl Athelwold* his favourite; and ordered him, on some pretence or other, to visit the Earl of Devonshire, and bring him a certain account concerning *Elfrida*. *Athelwold* went as he was desired; but fell so deeply in love with the lady himself, that he resolved to sacrifice his fidelity to his passion. He returned to Edgar, and told him, that *Elfrida's* charms were by no means extraordinary, and would have been totally overlooked in a woman of inferior station. After some time, however, turning the conversation again upon *Elfrida*, he told the king that he thought her parentage and fortune made her a very advantageous match; and therefore, if the king gave his consent, he would make proposals to the Earl of Devonshire on his own behalf. Edgar consented, and *Athelwold* was married to *Elfrida*.—After his marriage, he used his utmost endeavours to keep his wife from court, that Edgar might have no opportunity of observing her beauty. The king, however, was soon informed of the truth; and told *Athelwold* that he intended to pay him a visit in his castle, and be made acquainted with his new-married wife. The Earl could make no objections; only he desired a few hours to prepare for the visit. He then confessed the whole

to *Elfrida*, and begged of her to appear before the king as much to the disadvantage as possible. Instead of this, she dressed herself to the greatest advantage. Edgar immediately conceived a violent passion for her; and, in order to gratify it, seduced *Athelwold* into a wood under pretence of hunting, where he stabbed him with his own hand, and afterwards married his widow.

The reign of Edgar is remarkable among historians for the encouragement he gave to foreigners to reside at his court and throughout the kingdom. These foreigners, it is said, corrupted the former simple manners of the nation. Of this simplicity, however, there seems to be no great reason to boast; seeing it could not preserve them from treachery and cruelty, the greatest of all vices: so that their acquaintance with foreigners was certainly an advantage to the people, as it tended to enlarge their views, and cure them of those illiberal prejudices and rustic manners to which islanders are often subject.—Another remarkable incident, is the extirpation of wolves from England. The king took great pleasure in hunting and destroying these animals himself. At last he found that they had all taken shelter in the mountains and forests of Wales. Upon this he changed the tribute imposed upon the Welsh princes by *Athelstan*, into an annual tribute of 300 wolves heads; and this produced such diligence in hunting them, that the animal has never since appeared in England.

Edgar died in 957, after a reign of 16 years. He left a son named *Edward*, whom he had by his first wife the daughter of *Earl Ordmer*; and another, named *Ethelred*, by *Elfrida*. The mental qualifications of this lady were by no means answerable to the beauty of her person. She was ambitious, haughty, treacherous, and cruel. The principal nobility, therefore, were greatly averse from the succession of her son *Ethelred*, which would unavoidably throw too much power into the hands of his mother, as he himself was only seven years of age. *Edward*, afterwards surnamed the *Martyr*, was therefore pitched upon; and was certainly the most proper person, as he was 15 years of age, and might soon be able to take the government into his own hands. *Elfrida* opposed his advancement with all her might: but *Dunstan* overcame every obstacle, by anointing and crowning the young prince at *Kingston*; upon which the whole kingdom submitted without farther opposition.

The only remarkable occurrence in this reign was the complete victory gained by the monks over the secular clergy, who were now totally expelled from the convents. Though this had been pretty nearly accomplished by Edgar, the secular clergy still had partisans in England who made considerable opposition; but these were all silenced by the following miracles. In one synod, *Dunstan*, finding the majority of votes against him, rose up, and declared that he had that instant received from heaven a revelation in favour of the monks. The whole assembly was so much overawed by this intelligence, that they proceeded no farther in their deliberations. In another synod, a voice issued from the crucifix, acquainting the members, that the establishment of the monks was founded on the will of heaven, and could not be opposed without impiety. But the third miracle was still more alarming. In another

63
The Wolves ex-
tirpated
from Eng-
land.

64
Edward the
martyr.

65
Miracles of
St Dunstan.

England. other synod the floor of the hall sunk, and great numbers of the members were killed or bruised by their fall. It was remarked that Dunstan had that day prevented the king from attending the synod, and that the beam on which his own chair stood was the only one which did not sink. These circumstances, instead of making him suspected as the author of the miracle, were regarded as proofs of the interposition of Providence in his favour.

66
The king
murdered.

Edward lived four years after he was raised to the throne, in perfect innocence and simplicity. Being incapable of any treacherous intention himself, he suspected none in others. Though his stepmother had opposed his succession, he had always behaved towards her with the greatest respect; and expressed on all occasions the most tender affection for his brother Ethelred. Being one day hunting in the neighbourhood of the castle where Elfrida resided, he paid her a visit unattended by any of his retinue. After mounting his horse with a design to return, he desired some liquor to be brought him. But while he was holding the cup to his head, a servant of Elfrida stabbed him behind. The king, finding himself wounded, clapped spurs to his horse; but soon becoming faint by the loss of blood, he fell from the saddle, and his foot being entangled in the stirrup, he was dragged along till he expired. His body was found and privately interred at Wereham by his servants. The English had such compassion for this amiable prince, that they bestowed on him the appellation of *Martyr*, and even fancied that miracles were wrought at his tomb. Elfrida built monasteries, and submitted to many penances, in order to atone for her guilt; but, even in that barbarous age, she could never regain the good opinion of the public.

67
Ethelred.

After the murder of Edward, his brother Ethelred succeeded to the throne without opposition. As he was a minor when he was raised to the throne, and, even when he came to man's estate, never discovered any vigour or capacity of defending the kingdom against invaders, the Danes began to renew their incursions. Before they durst attempt any thing of importance, however, they first made a small incursion by way of trial. In the year 981, they landed in Southampton from seven vessels; and having ravaged the country, they retired with impunity, carrying a great booty along with them. In 987, they made a similar attempt on the west coast, and were attended with the like success. Finding that matters were now in a favourable situation for their enterprises, they landed in Essex under the command of two chieftains; and, having defeated and killed Brithnot duke of that county, laid waste all the neighbouring provinces. In this extremity, Ethelred, surnamed, on account of his preposterous conduct, the *Unready*, bribed the enemy with L. 10,000 to depart the kingdom. This advice was given by Siricius archbishop of Canterbury, and some of the degenerate nobility; and was attended with the success that might have been expected. The Danes appeared next year off the eastern coast. But, in the mean time, the English had determined to assemble at London a fleet capable of repelling the enemy. This failed of success through the treachery of Alfric Duke of Mercia. Having been formerly banished the kingdom, and found great difficulty in getting himself restored to his former dignity, he trusted

68
England
invaded and
ruined by
the Danes.

thenceforth, not to his services or the affections of his countrymen, but to the influence he had over his vassals, and to the public calamities. These last he determined always to promote as far as he could; because in every revolution his assistance would be necessary, and consequently he must receive a continual accession of power. The English had formed a plan for surrounding and destroying the Danish fleet in the harbour; but Alfric not only gave the enemy notice of this design, but also deserted with his squadron the night before the engagement. The English by this means proved unsuccessful; and Ethelred, in revenge, took Alfgar, Alfric's son, and ordered his eyes to be put out. This piece of cruelty could be productive of no good effect. Alfric had become so powerful, that, notwithstanding his treachery, it was found impossible to deprive him of the government of Mercia.

In 993, the Danes under the command of Sweyn their king, and the Norwegians conducted by Olave king of that country, sailed up the Humber, and destroyed all around them. A powerful army was assembled to oppose these invaders; but through the treachery of the three leaders, all men of Danish extraction, the English were totally defeated. Encouraged by this success, the Danes entered the Thames in 94 vessels, and laid siege to London. The inhabitants, however, made such a brave defence, that the besiegers were finally obliged to give over the attempt. Out of revenge for this disappointment, they laid waste Essex, Suffex, and Hampshire. In these counties they procured horses; by which means they were enabled to penetrate into the more inland parts, and threatened the kingdom with total subjection. Ethelred and his nobles had now recourse to their former expedient. They sent ambassadors to the two northern kings, to whom they promised subsistence and tribute, provided they would, for the present, put an end to their ravages, and soon after depart the kingdom. They agreed to the terms, and peaceably took up their quarters at Southampton. Olave even paid a visit to Ethelred, and received the rite of confirmation from the English bishops. The king also made him many presents; and Olave promised never more to infest the English territories; which promise it is said he afterwards religiously observed.

After the departure of Olave with his Norwegians, Sweyn, though less scrupulous than the king of Norway, was obliged to leave the kingdom also. But this shameful composition procured only a short relief to the nation. The Danes soon after appeared in the Severn; and having ravaged Wales as well as Cornwall and Devon, they sailed round, and, entering the mouth of the Tamar, completed the ruin of these two counties. Then, returning to the Bristol channel, and penetrating into the country by the Avon, they over-ran all that country, and carried fire and sword even into Dorsetshire. In 998, they changed the seat of war; and, after ravaging the isle of Wight, they entered the Thames and Medway, where they laid siege to Rochester, and defeated the Kentish men in a great battle. After this victory, the whole province of Kent was made a scene of slaughter and devastation. The extremity of these miseries forced the English into counsels for common defence both by sea and land: but the weakness of the king, the divisions among the nobility, the treachery of some, the cowardice of others,

the

^{Eng'land} the want of concert in all, frustrated every endeavour; and their fleets and armies either came too late to attack the enemy, or were repulsed with dishonour. The English, therefore, devoid both of prudence and unanimity in council, had recourse to the expedient which by experience they had found to be ineffectual. They offered the Danes a large sum if they would conclude a peace and depart the kingdom. These ravagers continually rose in their demands; and now required the payment of L.24,000, which the English submitted to give. The departure of the Danes procured them a temporary relief; which they enjoyed as if it was to be perpetual, without making any effectual preparations for giving them a more vigorous reception upon their next return.

Besides the receiving this sum, the Danes were at present engaged by another motive to depart from England. They were invited over by their countrymen in Normandy, who at this time were hard pressed by Robert king of France, and who found it difficult to defend their settlements against him. It is probable also, that Ethelred, observing the close connection of all the Danes with one another, however they might be divided in government or situation, was desirous of procuring an alliance with that formidable people. For this purpose, being at present a widower, he made his addresses to Emma, sister to Richard II. Duke of Normandy. He soon succeeded in his negotiations; the princess came over to England, and was married to the king in the year 1001.

⁶⁹
Marriage of
the king
with the
princess of
Normandy.

Though the Danes had been for a long time established in England, and though the similarity of their language with the Saxon had invited them to an early coalition with the natives; they had as yet found so little example of civilized manners among the English, that they retained all their ancient ferocity, and valued themselves only on their national character of military bravery. The English princes had been so well acquainted with their superiority in this respect, that Athelston and Edgar had been accustomed to keep in pay large bodies of Danish troops, who were quartered about the country, and committed many violences upon the inhabitants. These mercenaries had attained to such an height in luxury, according to the old English writers, that they combed their hair once a-day, bathed themselves once a-week, changed their clothes frequently; and by all these arts of effeminacy, as well as by their military character, had rendered themselves so agreeable to the fair sex, that they debauched the wives and daughters of the English, and had dishonoured many families. But what most provoked the inhabitants was, that, instead of defending them against invaders, they were always ready to betray

N 115.

them to the foreign Danes, and to associate themselves with every straggling party which came from that nation. ^{England.}

The animosities between the native English and the Danes ⁷⁰ who inhabited among them, had from these causes risen to a great height; when Ethelred, from a policy commonly adopted by weak princes, took the cruel resolution of massacring the Danes throughout the kingdom. On the 13th of November 1002, secret orders were dispatched to commence the execution every where on the same day; and the festival of St Brice, which fell on a Sunday, the day on which the Danes usually bathed themselves, was chosen for this purpose. These cruel orders were executed with the utmost exactness. No distinction was made betwixt the innocent and the guilty; neither sex nor age was spared; nor were the cruel executioners satisfied without the tortures, as well as death, of the unhappy victims. Even Gunilda, sister to the king of Denmark, who had married Earl Palling, and had embraced Christianity, was, by the advice of Edric Earl of Wilts, seized and condemned to death by Ethelred, after seeing her husband and children butchered before her face. This unhappy princess foretold, in the agonies of despair, that her murder would soon be avenged by the total ruin of the English nation (A).

The prophecy of Gunilda was exactly fulfilled. In 1003, Sweyn and his Danes, who wanted only a pretence to renew their invasions, appeared off the western coast, and threatened revenge for the slaughter of their countrymen. The English took measures for repulsing the enemy; but these were defeated thro' the treachery first of Alfric; and then of Edric, a still greater traitor, who had married the king's daughter, and succeeded Alfric in the command of the British armies. The Danes therefore ravaged the whole country. Agriculture was neglected, a famine ensued, and the kingdom was reduced to the utmost degree of misery. At last the infamous expedient of buying a peace was resorted to; and the departure of the Danes was purchased, in 1007, at the expence of L.30,000. ⁷¹
New invasion by Sweyn.

The English endeavoured to employ this interval in making preparations against the return of the Danes, which they had reason soon to expect. A law was made, ordering the proprietors of eight hides of land to provide themselves of a horseman and a complete suit of armour; and those of 310 hides to equip a ship for the defence of the kingdom. By this means a formidable armament was raised. There were 243,600 hides in England; consequently the ships equipped must be 785. The cavalry was 30,450 men. All hopes of success from this equipment, however, were disappointed by the factions, animosities, and dissensions

(A) On the subject of this massacre, Mr Hume has the following observations: "Almost all the ancient historians speak of this massacre of the Danes as if it had been universal, and as if every individual of that nation throughout England had been put to death. But the Danes were almost the sole inhabitants in the kingdoms of Northumberland and East Anglia, and were very numerous in Mercia. This representation of the matter was absolutely impossible. Great resistance must have been made, and violent wars ensued; which was not the case. This account given by Wallingford, though he stands single, must be admitted as the only true one. We are told that the name of *lurdane*, *lord Dane*, for an idle lazy fellow who lives at other peoples expence, came from the conduct of the Danes who were put to death. But the English princes had been entirely masters for several generations; and only supported a military corps of that nation. It seems probable, therefore, that these Danes only were put to death."

England. tions of the nobility. Edric had caused his brother Brightric to advance an accusation of treason against Wolfnoth governor of Suffex, the father of the famous Earl Godwin; and that nobleman, knowing the power and malice of his enemy, consulted his own safety by deserting with 20 ships to the Danes. Brightric pursued him with a fleet of 80 sail; but his ships being shattered in a tempest, and stranded on the coast, he was suddenly attacked by Wolfnoth, and all his vessels were burnt or otherwise destroyed. The treachery of Edric frustrated every plan of future defence; and the whole navy was at last scattered into the several harbours.

By these fatal miscarriages, the enemy had leisure to over-run the whole kingdom. They had now got such a footing, indeed, that they could hardly have been expelled though the nation had been ever so unanimous. But so far did mutual diffidence and dissension prevail, that the governors of one province refused to march to the assistance of another; and were at last terrified from assembling their forces for the defence of their own. At last the usual expedient was tried. A peace was bought with L.48,000; but this did not procure even the usual temporary relief. The Danes, knowing that they were now masters of the kingdom, took the money, and continued their devastations. They levied a new contribution of L.8000 on the county of Kent alone; murdered the archbishop of Canterbury, who had refused to countenance this exaction; and the English nobility submitted everywhere to the Danish monarch, swearing allegiance to him, and giving hostages for their good behaviour. At last, Ethelred himself, dreading equally the violence of the enemy and the treachery of his own subjects, fled into Normandy, whither he had already sent queen Emma and her two sons Alfred and Edward. The Duke received his unhappy guests with a generosity which does honour to his memory.

72
Ethelred
flies to Nor-
mandy.

73
Returns,
but behaves
as ill as
ever.

The flight of king Ethelred happened in the end of the year 1013. He had not been above six weeks in Normandy, when he heard of the death of Sweyn, which happened at Gainsborough before he had time to establish himself in his new dominions. At the same time he received an invitation from the prelates and nobility to resume the kingdom; expressing also their hopes, that, being now better taught by experience, he would avoid those errors which had been so fatal to himself and his people. But the misconduct of Ethelred was incurable; and, on his resuming the government, he behaved in the very same manner that he had done before. His son-in-law Edric, notwithstanding his repeated treasons, retained such influence at court, that he instilled into the king jealousies of Sigefert and Morcar, two of the chief nobles of Mercia. Edric enticed them into his house, where he murdered them; while Ethelred partook of the infamy of this action, by confiscating their estates, and confining the widow of Sigefert in a convent. She was a woman of singular beauty and merit; and in a visit which was paid her, during her confinement, by prince Edmund the king's eldest son, she inspired him with so violent an affection, that he released her from the convent, and soon after married her without his father's consent.

In the mean time, Canute, the son and successor of Sweyn, proved an enemy no less terrible to the English

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than his father had been. He ravaged the eastern coast with merciless fury; and put ashore all the English hostages at Sandwich, after having cut off their hands and noses. He was at last obliged, by the necessity of his affairs, to return to Denmark. In a short time, however, he returned, and continued his depredations along the southern coast. He then broke into the counties of Dorset, Wilts, and Somerset; where an army was assembled against him under the command of Prince Edmund and Duke Edric. The latter still continued his perfidious machinations; and after endeavouring in vain to get the prince into his power, found means to dissipate the army, and then deserted to Canute with 40 vessels.

Edmund was not disheartened by this treachery. He again assembled his forces, and was in a condition to give the enemy battle. Ethelred, however, had now such frequent experience of the treachery of his subjects, that he had lost all confidence in them. He remained in London, pretending sickness, but in reality from an apprehension that they intended to buy their peace by delivering him into the hands of his enemies. The army called aloud for their sovereign to march at their head against the Danes; and on his refusal to take the field, they were so discouraged, that all the preparations which had been made became ineffectual for the defence of the kingdom. Edmund, deprived of all regular resources for the maintenance of the soldiers, was obliged to commit similar ravages to those practised by the Danes; and after making some fruitless expeditions into the north, which had submitted entirely to Canute's power, he returned to London, where he found every thing in confusion by the death of the king.

Ethelred died in 1016, after an unhappy reign of 35 years; and was succeeded by his eldest son Edmund, surnamed *Ironside* on account of his great strength and valour. He possessed abilities sufficient to have saved his country from ruin, had he come sooner to the throne; but it was now too late. He bravely opposed the Danes, however, notwithstanding every disadvantage; till at last the nobility of both nations obliged their kings to come to a compromise, and divide the kingdom between them by treaty. Canute reserved to himself Mercia, East Anglia, and Northumberland, which he had entirely subdued. The southern parts were left to Edmund. This prince survived the treaty only about a month; being murdered at Oxford by two of his chamberlains, accomplices of Edric.

After the death of Edmund, nothing was left for the English but submission to Canute. The least scrupulous of mankind, however, dare not at all times openly commit injustice. Canute, therefore, before he seized the dominions of Edwin and Edward, the two sons of Edmund, suborned some of the nobility to depose, that, in the last treaty with Edmund, it had been verbally agreed, that, in case of Edmund's death, Canute should either be successor to his dominions, or tutor to his children; for historians differ with regard to this particular. This evidence, supported by the great power of Canute, was sufficient to get him elected king of England. Immediately after his accession to the throne, he sent the two sons of Edmund to the court of Sweden, on pretence of being there educated;

England.

74
Edmund
Ironside di-
vides the
kingdom
with the
Danes.

75
Canute.

England. but charged the king to put them to death as soon as they arrived. The Swedish monarch did not comply with this request; but sent them to Solomon king of Hungary, to be educated in his court. The elder, Edwin, was afterwards married to Solomon's sister: but he dying without issue, that prince gave his sister-in-law, Agatha, daughter of the emperor Henry II. in marriage to Edward, the younger brother; and she bore him Edgar Atheling; Margaret, afterwards queen of Scotland; and Christina, who retired into a convent.

76
Marries
Ethelred's
widow.

Canute was obliged at first to make great concessions to the nobility: but he afterwards put to death many of those in whom he could not put confidence; and, among the rest, the traitor Edric himself, who was publicly executed, and his body thrown into the Thames. In order to prevent any danger from the Normans, who had threatened him with an invasion, he married Emma the widow of Ethelred, and who now came over from Normandy; promising that he would leave the children he should have by that marriage heirs to the crown after his decease. The English were at first displeased with Emma for marrying the mortal enemy of her former husband; but at the same time were glad to find at court a sovereign to whom they were accustomed, and who had already formed connections with them: and thus Canute, besides securing by his marriage the alliance with Normandy, gradually acquired by the same means the confidence of his own people.

The most remarkable transaction in this prince's reign, besides those mentioned under the article CANUTE, is his expedition to Scotland against Malcolm king of that country, whom he forced to do homage for the county of Cumberland, which the Scots at that time possessed. After this enterprise, Canute passed four years in peace, and died at Shaftsbury; leaving three sons, Sweyn, Harold, and Hardicanute. Sweyn, whom he had by his first marriage with Alfwen, daughter of the earl of Hampshire, was crowned in Norway; Hardicanute, whom Emma had born, was in possession of Denmark; and Harold, who was of the same marriage with Sweyn, was at that time in England.

77
Harold.

Harold succeeded to the crown of England; though it had been stipulated that Emma's son, Hardicanute, should be heir to that kingdom. This advantage Harold obtained by being on the spot, and getting possession of his father's treasures, while Hardicanute was at a distance. As Hardicanute, however, was supported by earl Godwin, a civil war was likely to ensue, when a compromise was made; by which it was agreed, that Harold should enjoy London, and all the provinces north of the Thames, while the possession of the south should remain to Hardicanute: and till that prince should appear and take possession of his dominions, Emma fixed her residence at Winchester, and ruled her son's part. Harold reigned four years; during which time, the only memorable action he performed was a most infamous piece of treachery.—Alfred and Edward, the two sons of Emma by Ethelred, paid a visit to their mother in England. But, in the mean time, earl Godwin being gained over by Harold, a plan was laid for the destruction of the two princes. Alfred was accordingly invited to London by Harold,

78
His treach-
ery and
cruelty.

with many professions of friendship; but when he had reached Guildford, he was set upon by Godwin's vassals; about 600 of his train were murdered in the most cruel manner; he himself was taken prisoner, his eyes were put out, and he was conducted to the monastery of Ely, where he died soon after. Edward and Emma, apprised of the fate which awaited them, fled beyond sea, the former into Normandy, the latter into Flanders; while Harold took possession of all his brother's dominions without opposition.—He died in April 1039.

Hardicanute succeeded his brother Harold without opposition. His government was extremely violent and tyrannical. However, it was but of short duration. He died, in 1041, of a debauch at the marriage of a Danish lord. After his death, a favourable opportunity was offered to the English for shaking off the Danish yoke. Sweyn, king of Norway, the eldest son of Canute, was absent; and as the two last kings had died without issue, there appeared none of that race whom the Danes could support as successor to the throne. For this reason, the eyes of the nation were naturally drawn towards prince Edward, who happened to be at court when the king died. There were some reasons, however, to fear, that Edward's succession would be opposed by earl Godwin, who was by far the most powerful nobleman in the kingdom. A declared animosity subsisted between Edward and Godwin, on account of the hand which the latter had in the murder of his brother Alfred; and this was thought to be an offence of so grievous a nature, that Edward could never forgive it. But here their common friends interposed; and representing the necessity of their good correspondence, obliged them to lay aside their animosities, and to concur in restoring liberty to their native country. Godwin only stipulated that Edward, as a pledge of his sincere reconciliation, should promise to marry his daughter Editha. This proposal was agreed to; Edward was crowned king of England, and married Editha as he had promised. The marriage, however, proved rather a source of discord than otherwise between the king and Godwin. Editha, though a very amiable woman, could never obtain the confidence and affection of her husband. It is even said, that, during the whole course of her life, he abstained from all matrimonial converse with her; and this ridiculous behaviour was highly celebrated by the monkish writers of the age, and contributed to the king's acquiring the title of Saint and Confessor.

79
Edward the
Confessor.

Though the neglect of his daughter could not fail to awaken Godwin's former enmity against king Edward, it was necessary to choose a more popular ground before he could vent his complaints against the king in a public manner. He therefore chose for his theme the influence which the Normans had on the affairs of the government; and a declared opposition took place between him and these favourites. In a short time, this animosity openly broke out with great violence. Eustace count of Bologne having paid a visit to the king, passed by Dover on his return. One of his train being refused access to a lodging which had been appointed for him, attempted to make his way by force, and wounded the master of the house in the contest. The townsmen revenged this insult by the death of the stranger; the count and his train took arms, and

80
Variance of
the king
and earl
Godwin.

mur-

England.

murdered the townsman in his own house. A tumult ensued; near 20 persons were killed on each side; and Eustace being overpowered with numbers, was at last obliged to fly. He complained to the king; who gave orders to earl Godwin, in whose government Dover lay, to punish the inhabitants. But this nobleman refused to obey the command, and endeavoured to throw the whole blame on count Eustace and his followers. The king was displeased; and threatened to make him feel the utmost effects of his resentment, in case he finally refused to comply. Upon this, Godwin assembled a powerful army, on pretence of repressing some disorders on the frontiers of Wales; but, instead of this, marched directly to Gloucester, where the king at that time was without any military force, as suspecting no danger.

81
Godwin
flies to Flan-
ders.

Edward perceiving his danger, applied to Siward duke of Northumberland, and Leofric duke of Mercia, two very powerful noblemen. They hastened to him with such followers as they could assemble, issuing orders at the same time for all the forces under their respective governments to march without delay to the defence of the king. Godwin, in the mean time, suffered himself to be deceived by negotiations, till the king's army became so powerful, that he was not able to cope with it. He was therefore obliged to fly with his family to Flanders. Here he was protected by Baldwin earl of that country, together with his three sons Gurth, Sweyn, and Tosti; the last of whom had married Baldwin's daughter. Harold and Leofwin, two other sons of Godwin, took shelter in Ireland.

82
Returns,
and is re-
conciled
with the
king.

After the flight of earl Godwin, he was proceeded against as a traitor by king Edward. His estates, and those of his sons, were confiscated; his governments given to others; queen Editha was confined in a monastery; and the great power of this family, which had become formidable to the crown itself, seemed to be totally overthrown. Godwin, however, soon found means to retrieve his affairs. Having hired some ships, and manned them with his followers, he attempted to make a descent at Sandwich. The king, informed of his preparations, equipped a fleet which Godwin could not resist, and he therefore retreated into the Flemish harbours. On his departure, the English dismissed their armament. This Godwin had expected, and therefore kept himself in readiness for the favourable opportunity. He immediately put to sea, and failed to the Isle of Wight, where he was joined by Harold with a squadron which he had collected in Ireland. Being thus master of the sea, Godwin entered the harbours on the southern coast; seized all the ships; and being joined by great numbers of his former vassals, he sailed up the Thames, and appeared before London.

The approach of such a formidable enemy threw every thing into confusion. The king alone seemed resolute to defend himself to the last extremity; but the interposition of many of the nobility, together with the submissions of Godwin himself, at last produced an accommodation. It was stipulated, that Godwin should give hostages for his good behaviour, and that all the foreigners should be banished the kingdom; after which, Edward, sensible that he had not power sufficient to detain the earl's hostages in England, sent

them over to his kinsman the young duke of Normandy.

England.

Soon after this reconciliation, Godwin died as he was sitting at table with the king. He was succeeded in the government of Wessex, Suffex, Kent, and Essex, and in the office of steward of the household, a place of great power, by his son Harold. The son was no less ambitious than his father had been; and as he was a man of much greater abilities, he became a more dangerous enemy to Edward than even Godwin had been. Edward knew no better expedient to prevent the increase of Harold's power, than by giving him a rival. This was Algar son of Leofric duke of Mercia, whom he invested with the government of East Anglia, which had formerly belonged to Harold. The latter, however, after some broils, finally got the better of his rival, and banished him the kingdom. Algar returned soon after with an army of Norwegians, with whom he invaded East Anglia; but his death in a short time freed Harold from all further apprehensions from that quarter. His power was still further increased in a short time after by the accession of his brother Tosti to the government of Northumberland; and Edward now declining in years, and apprehensive that Harold would attempt to usurp the crown after his death, resolved to appoint a successor. He therefore sent a deputation into Hungary, to invite over his nephew, Edward, son to his elder brother, who was the only remaining heir of the Saxon line. That prince accordingly came over with his children, Edgar Atheling, Margaret, and Christina; but died a few days after his arrival. His death threw the king into greater perplexity than ever. Being resolved to exclude Harold if possible, he secretly cast his eye on his kinsman William duke of Normandy; a person of whose power, character, and capacity, he had justly a very high opinion. This advice had formerly been given him by Robert archbishop of Canterbury, who was himself a Norman, and had been banished along with the rest upon the return of earl Godwin. But Edward finding that the English would more easily acquiesce in the restoration of the Saxon line, had in the mean time invited his brother's descendants from Hungary as already mentioned. The death of his nephew, and the inexperience and unpromising qualities of young Edgar, made him resume his former intentions in favour of the duke of Normandy, though his aversion to hazardous enterprises engaged him to postpone the execution, and even to keep his purpose concealed from all his ministers.

Harold in the mean time increased his popularity by all possible means, in order to prepare his way for being advanced to the throne after the death of Edward, which now seemed to be fast approaching. He had no suspicion of the duke of Normandy as a rival; but as he knew that a son and grandson of the earl Godwin were in the hands of that prince as hostages, he feared that they might be made use of as checks upon his ambition, in case he attempted afterwards to ascend the throne. He therefore prevailed upon Edward to release these hostages unconditionally; and having obtained his consent, he set out for Normandy himself, attended by a numerous retinue. He was driven by a tempest on the territory of Guy count of

83
His son Ha-
rold aspires
to the
crown.

England.

Ponthieu, who detained him prisoner, and demanded an exorbitant sum for his ransom. Harold found means to acquaint William with his situation. The duke of Normandy, desirous of gaining Harold over to his party, commanded Guy to restore his prisoner to his liberty. Upon this Harold was immediately put into the hands of the Norman ambassador, who conducted him to Rouen. William received him with great demonstrations of respect and friendship; but soon took an opportunity of acquainting him with his pretensions to the crown of England, and asked his assistance in the execution of his scheme. Harold was surprised with this declaration of the duke; but being entirely in his power, he feigned a compliance with his desires, and promised to second to the utmost of his ability the will of king Edward. William, to secure him as much as possible to his interest, promised him his daughter in marriage, and required him to take an oath that he would fulfil his promises. Harold readily complied; but to make the oath more binding, William privately conveyed under the altar where the oath was taken, reliques of some of the most revered martyrs; and when Harold had taken the oath, he showed him the relics, and admonished him to observe religiously such a solemn engagement.

Harold was no sooner at liberty, than he found himself master of casuistry sufficient to excuse the breaking of his oath, which had been extorted from him, and which, if kept, might be attended with the subjection of his country to a foreign power. He continued to practise every art to increase his popularity; and about this time, two accidents enabled him to add much to that character which he had already so well established. The Welsh had for some time made incursions into the English territories, and had lately become so troublesome, that Harold thought he could not do a more acceptable piece of service to the public, than undertake an expedition against these invaders. Having therefore prepared some light-armed foot to pursue the natives into their fortresses, some cavalry to secure the open country, and a squadron of ships to attack the sea-coasts, he employed all these forces against the enemy at once; and thus reduced them to such distress, that they were obliged to purchase peace by sending their prince's head to Harold, and submitting to the government of two Welsh noblemen appointed by Edward.

The other incident was no less honourable to Harold. Tosti his brother had been created duke of Northumberland; but being of a violent tyrannical temper, had treated the inhabitants with such cruelty, that they rose in rebellion against him, and drove him from his government. Morcar and Edwin, two brothers, grandsons of the great duke Leofric, joined in the insurrection; and the former being elected duke, advanced with an army to oppose Harold, who had been commissioned by the king to reduce and punish the Northumbrians. Before the armies engaged, Morcar endeavoured to justify his conduct, and represented to Harold, that Tosti had behaved in such a manner, that no one, not even a brother, could defend him without participating of the infamy of his conduct: that the Northumbrians were willing to submit to the king, but required a governor that would pay some attention to their privileges; and they trust-

ed that Harold would not defend in another that violent conduct from which his own government had always kept at so great a distance. This speech was accompanied by such a detail of well-supported facts, that Harold abandoned his brother's cause; and returning to Edward, persuaded him to pardon the Northumbrians, and confirm Morcar in his government. He even married the sister of that nobleman; and by his interest procured Edwin the younger brother to be chosen governor of Mercia. Tosti, in a rage, departed the kingdom, and took shelter in Flanders with Baldwin his father-in-law; while William of Normandy saw that now he had nothing to expect from Harold, who plainly intended to secure the crown for himself.

Edward died in 1067, and was succeeded by Harold with as little opposition as though he had been the lawful heir. The very day after Edward's death, he was anointed and crowned by the archbishop of York. The whole nation seemed joyfully to swear allegiance to him. But he did not long enjoy the crown, to obtain which he had taken so much pains, and which he seemed to have such capacity for wearing. His brother Tosti, provoked at his success, stirred up against him every enemy he could have any influence with. The duke of Normandy also was enraged to the last degree at the perfidy of Harold; but before he commenced hostilities, he sent an embassy to England, upbraiding the king with his breach of faith, and summoning him to resign the kingdom immediately. Harold replied, that the oath, with which he was reproached, had been extorted by the well-grounded fear of violence, and for that reason could never be regarded as obligatory: that he never had any commission either from the late king or the states of England, who alone could dispose of the crown, to make any tender of the succession to the duke of Normandy; and if he, a private person, had assumed so much authority, and had even voluntarily sworn to support the Duke's pretensions, the oath was unlawful, and it was his duty to take the first opportunity of breaking it: that he had obtained the crown by the unanimous suffrages of the people; and should show himself totally unworthy of their favour, did he not strenuously maintain those liberties with which they had entrusted him; and that the Duke, if he made any attempt by force of arms, should experience the power of an united nation, conducted by a prince, who, sensible of the obligations imposed on him by his royal dignity, was determined, that the same moment should put a period to his life and to his government.

This answer was according to William's expectations; and therefore he had already made preparations for invading England. He was encouraged and assisted in this enterprise by Howel count of Brittany, Baldwin earl of Flanders, the emperor Henry IV. and pope Alexander II. The latter declared Harold a perjured usurper; denounced excommunication against him and his adherents; and the more to encourage William in his enterprises, sent him a consecrated banner, and a ring with one of St Peter's hairs in it. Thus he was enabled to assemble a fleet of 3000 vessels, on board of which were embarked 60,000 men, chosen from among those numerous supplies which were sent him from all quarters. Many eminent personages were enlisted under

84
Harold succeeds Edward the Confessor.

England. der his banners. The most celebrated were Eustace count of Boulogne, Aimeri de Thouars, Hugh d'Estaples, William d'Evreux, Geoffroy de Rotrou, Roger de Beaumont, William de Warenne, Roger de Montgomeri, Hugh de Grantmesnil, Charles Martel, and Geoffroy Gifford.

85
Defeats the
Danes.

In order to embarrass the affairs of Harold the more effectually, William also excited Tosti, in concert with Halfager king of Norway, to infest the English coasts. These two having collected a fleet of 350 ships, sailed up the Humber, and disembarked their troops, who began to commit great depredations. They were opposed by Morcar earl or duke (B) of Northumberland, and Ed-

win earl of Mercia, who were defeated. Harold, on the news of this invasion, assembled a considerable army, engaged the enemy at Stamford, and after a bloody battle entirely defeated them. Tosti and Halfager were killed in the action, and all the fleet fell into the hands of the victors; but Harold generously allowed Olave the son of Halfager to depart with 20 vessels. The king of England had scarce time to rejoice on account of his victory, when news were brought him that the Normans were landed in Suffex. Harold's victory had considerably weakened his army. He lost many of his bravest officers and soldiers in the action; and he disgusted the rest, by refusing to distribute the Danish spoils among them. He hastened, however, by quick marches, to repel this new invader; but though he was reinforced at London and other places with fresh troops, he found himself weakened by the desertion of his old soldiers, who, from fatigue and discontent, secretly withdrew from their colours. Gurth, the brother of Harold, a man of great conduct as well as bravery, became apprehensive of the event; and entreated the king to avoid a general engagement for some time, or at least not to hazard his person. But though this advice was in itself evidently proper, and enforced by all the arguments which Gurth could suggest, Harold continued deaf to every thing that could be said. Accordingly, on the 14th of October 1066, the two armies engaged near Hastings, a town of Suffex. After a most obstinate and bloody battle*, the English were entirely defeated, Harold and his two brothers killed, and William left master of the kingdom of England.

86
Is defeated
and killed
by William
of Norman-
dy.
* See Ha.
fing.

87
William the
Conqueror.

Nothing could exceed the terror of the English upon the news of the defeat and death of Harold. As soon as William passed the Thames at Wallingford, Stigand, the primate, made submissions to him in the name of the clergy; and before he came within sight of London, all the chief nobility, and even Edgar Atheling himself, who, being the rightful heir to the throne, had just before been declared king, came and submitted to the conqueror. William very readily accepted of the crown upon the terms that were offered him; which were, that he should govern according to the established customs of the country. He could indeed have made what terms he pleased; but, though really a conqueror, he chose rather to be thought an elected king. For this reason he was crowned at Westminster by the archbishop of York, and took the oath administered to the former kings of England; namely,

that he would protect and defend the church, observe the laws of the realm, and govern the kingdom with impartiality.

The English historians complain of the most grievous oppression by William and his Normans. Whether by his conduct the conqueror willingly gave the English opportunities of rebelling against him, in order to have a pretence for oppressing them afterwards, is not easy to say; but it is certain that the beginning of his reign cannot justly be blamed. The first disgust against his government was excited among the clergy. William could not avoid the rewarding of those numerous adventurers who had accompanied him in his expedition. He first divided the lands of the English barons who had opposed him among his Norman barons; but as these were found insufficient, he quartered the rest on the rich abbey, of which there were many in the kingdom, until some other opportunity of providing for them offered itself.

Though this last step was highly resented by the clergy, it gave very little offence to the laity. The whole nation, however, was soon after disgusted, by seeing all the real power of the kingdom placed in the hands of the Normans. He disarmed the city of London, and other places which appeared most warlike and populous, and quartered Norman soldiers wherever he dreaded an insurrection. This was indeed acting as a conqueror, and not as an elected king; but the event showed the necessity of such precautions. The king having thus secured, as he imagined, England from any danger of a revolt, determined to pay a visit to his Norman dominions. He appointed his brother Odo, bishop of Bayeaux, and William Fitz-Osborne, regents in his absence; and to secure himself yet farther, he resolved to carry along with him such of the English nobility as he put the least confidence in.

Having taken all these methods to ensure the tranquillity of his new kingdom, William set sail for Normandy in March 1067; but his absence produced the most fatal consequences. Discontents and murmurings were multiplied everywhere; secret conspiracies were entered into against the government; hostilities were commenced in many places; and every thing seemed to threaten a speedy revolution. William of Poitiers, a Norman historian, throws the blame entirely on the English. He calls them a fickle and mutinous race, while he celebrates with the highest encomiums the justice and lenity of Odo's and Fitz-Osborne's administration. On the other hand, the English historians tell us, that these governors took all opportunities of oppressing the people, either with a view to provoke them to rebellion, or in case they tamely submitted to their impositions, to grow rich by plundering them. Be this as it will, however, a secret conspiracy was formed among the English for a general massacre of the Normans, like what had formerly been made of the Danes. This was prosecuted with so much animosity, that the vassals of the earl of Coxo put him to death because he refused to head them in the enterprise. The conspirators had already taken the resolution, and fixed the day for their intended massacre, which was to be on Ash-Wednesday, during the time of divine service,

(B) Anciently these two titles were synonymous.

England. vice, when all the Normans would be unarmed as penitents, according to the discipline of the times. But the presence of William disconcerted all their schemes. Having got intelligence of their bloody purpose, he hastened over to England. Such of the conspirators as had been more open in their rebellion, consulted their safety by flight; and this served to confirm the proofs of an accusation against those who remained. From this time the king not only lost all confidence in his English subjects, but regarded them as inveterate and irreconcilable enemies. He had already raised such a number of fortresses in the country, that he no longer dreaded the tumultuous or transient efforts of a discontented multitude. He determined therefore to treat them as a conquered nation. The first instance of this treatment was his revival of the tax of Danegelt, which had been imposed by the Danish conquerors, and was very odious to the people. This produced great discontents, and even insurrections. The inhabitants of Exeter and Cornwall revolted; but were soon reduced, and obliged to implore the mercy of the conqueror. A more dangerous rebellion happened in the north; but this was also soon quashed, and the English became sensible that their destruction was intended. Their easy submission after the battle of Hastings had inspired the Normans with contempt; their commotions afterwards had rendered them objects of hatred; and they were now deprived of every expedient which could make them either regarded or beloved by their sovereign. Many fled into foreign countries; and among the rest Edgar Atheling himself, who made his escape to Scotland, and carried thither his two sisters Margaret and Christina. They were well received by Malcolm, who soon after married Margaret the elder sister, and also received great numbers of other exiles with the utmost kindness.

The English, though unable to make any resistance openly, did not fail to gratify their resentment against the Normans in a private manner. Seldom a day passed, but the bodies of assassinated Normans were found in the woods and high-ways, without any possibility of bringing the perpetrators to justice. Thus, at length, the conquerors themselves began again to wish for tranquillity and security; and several of them, though entrusted with great commands, desired to be dismissed the service. In order to prevent these desertions, which William highly resented, he was obliged to allure others to stay by the largeness of his bounties. The consequences were, fresh exactions from the English, and new insurrections on their part against their cruel masters. The Norman power, however, was too well founded to be now removed, and every attempt of the English to regain their liberty served only to rivet their chains the more firmly. The county of Northumberland, which had been most active in these insurrections, now suffered most severely. The whole of it was laid waste, the houses were burned, the instruments of agriculture destroyed, and the inhabitants forced to seek new places of abode. On this occasion it is said that above 100,000 persons perished either by the sword or famine; and the country is supposed, even to this day, to retain the marks of its ancient depopulation. The estates of all the English gentry were next confiscated, and bestowed on the Normans. By this means all the ancient and honourable families were re-

duced to beggary; and the English found themselves England. totally excluded from every road that led either to honour or preferment.

By proceeding in this manner, William at last broke the spirit of the English nation, and received no farther trouble from them. In 1076, however, he found⁸⁹ that the latter part of his life was likely to be unhappy through dissensions in his own family. He had four sons, Robert, Richard, William, and Henry, besides several daughters. Robert, his eldest son, surnamed *Curthose*, from the shortness of his legs, was a prince who inherited all the bravery and ambition of his family. He had formerly been promised by his father the government of the province of Maine in France, and was also declared successor to the dukedom of Normandy. He demanded from his father the fulfilment of these promises; but William gave him a flat denial, observing, that "it was not his custom to throw off his clothes till he went to bed." Robert declared his resentment; and openly expressed his jealousy of his two brothers William and Henry, (for Richard was killed, in hunting, by a stag). An open rupture was soon commenced. The two young princes one day took it into their heads to throw water on their elder brother as he passed through the court after leaving their apartment. Robert construed this frolic into a studied indignity; and having these jealousies still farther inflamed by one of his favourites, he drew his sword, and ran up stairs with an intent to take revenge. The whole castle was quickly filled with tumult, and it was not without some difficulty that the king himself was able to appease it. But he could not allay the animosity which from that moment prevailed in his family. Robert, attended by several of his confederates, withdrew to Rouen that very night, hoping to surprise the castle; but his design was defeated by the governor. The popular character of the prince, however, engaged all the young nobility of Normandy, as well as of Anjou and Brittany, to espouse his quarrel; even his mother is supposed to have supported him in his rebellion by secret remittances. The unnatural contest continued for several years; and William was at last obliged to have recourse to England for support against his own son. Accordingly, he drew an army of Englishmen together; he led them over to Normandy, where he soon compelled Robert and his adherents to quit the field, and was quickly re-instated in all his dominions. Robert then took shelter in the castle of Gerberoy, which the king of France had provided for him, where he was shortly after besieged by his father. As the garrison was strong, and conscious of their treason, they made a gallant defence; and many skirmishes and duels were fought under its walls. In one of these the king and his son happened to meet; but being both concealed by their helmets, they attacked each other with mutual fury. The young prince wounded his father in the arm, and threw him from his horse. The next blow would probably have put an end to his life, had he not called for assistance. Robert instantly recollected his father's voice, leaped from his horse, and raised him from the ground. He prostrated himself in his presence, asked pardon for his offences, and promised for the future a strict adherence to his duty. The king was not so easily appeased; and perhaps his resentment was heightened

England. by the disgrace of being overcome. He therefore gave his malediction to his son; and returned to his own camp on Robert's horse, which he had assisted him to mount. After some recollection, however, he was reconciled to Robert, and carried him with him into England.

William returned in 1081; and being now freed from his enemies both at home and abroad, began to have more leisure to attend to his own domestic affairs. For this purpose the *Doomsday-Book* was composed by his order, of which an account is given under that article. He reserved a very ample revenue for the crown; and in the general distribution of land among his followers, kept possession of no fewer than 1400 manors in different parts of the country. No king of England was ever so opulent; none was able to support the splendor and magnificence of a court to such a degree; none had so many places of trust and profit to bestow; and consequently none ever had such implicit obedience paid to his commands. He delighted greatly in hunting; and to indulge himself in this with the greater freedom, he depopulated the county of Hampshire for 30 miles, turning out the inhabitants, destroying all the villages, and making the wretched outcasts no compensation for such an injury. In the time of the Saxon kings, all noblemen without distinction had a right to hunt in the royal forests; but William appropriated all these to himself, and published very severe laws to prohibit his subjects from encroaching on this part of his prerogative. The killing of a boar, a deer, or even an hare, was punished with the loss of the delinquent's eyes; at the time when the killing of a man might be atoned for by paying a moderate fine or composition.

As the king's wealth and power were so great, it may reasonably be supposed, that the riches of his ministers were in proportion. Odo, bishop of Bayeux, William's brother, was become so rich, that he resolved to purchase the papacy. For this purpose, taking the opportunity of the king's absence, he equipped a vessel in the Isle of Wight, on board of which he sent immense treasures, and prepared for his embarkation. He was detained, however, by contrary winds; and, in the mean time, William, being informed of his designs, resolved to prevent the exportation of so much wealth from his dominions. Returning therefore from Normandy, where he was at that time, he came to England the very instant his brother was stepping on board. He immediately ordered him to be made prisoner: but his attendants, respecting the bishop's ecclesiastical character, scrupled to execute his commands; so that the king was obliged to seize him with his own hand. Odo appealed to the Pope: but the king replied, that he did not seize him as bishop of Bayeux, but as earl of Kent; and, in that capacity, he expected, and would have, an account of his administration. He was therefore sent prisoner to Normandy; and, notwithstanding all the remonstrances and threats of pope Gregory, was detained in custody during the remainder of William's reign.

90
Death of
the queen;

Soon after this, William felt a severe blow in the death of Matilda his queen; and, almost at the same time, received information of a general insurrection in Maine, the nobility of which had always been averse to his government. Upon his arrival on the continent, he

found that the insurgents had been secretly assisted and excited by the king of France, who took all opportunities of lessening the Norman power, by creating dissensions among the nobles. His displeasure on this account was very much increased, by notice he received of some raileries thrown out against him by the French monarch. It seems that William, who was become corpulent, had been detained in bed some time by sickness; and Philip was heard to say, that he only lay in of a big belly. This so provoked the English monarch, that he sent him word, he would soon be up, and would, at his churching, present such a number of tapers as would set the kingdom of France in a flame.

To perform this promise, he levied a powerful army; and, entering the Isle of France, destroyed every thing with fire and sword. He took the town of Mante, and reduced it to ashes. But a period was soon put to the conquests and to the life of this great warrior by an accident. His horse happening to put his fore-feet on some hot ashes, plunged so violently, that the rider was thrown forward, and bruised his belly on the pommel of the saddle. Being now in a bad habit of body, as well as somewhat advanced in years, he began to be apprehensive of the consequences, and ordered himself to be carried in a litter to the monastery of St Ger-⁹¹vaise. Finding his illness increase, and being sensible of the approach of death, he discovered at last the vanity of all human grandeur; and was struck with remorse for those many cruelties and violences of which he had been guilty. He endeavoured to make compensation by presents to churches and monasteries, and gave orders for the liberation of several English noblemen. He was even prevailed upon, though not without reluctance, to release his brother Odo, against whom he was very much incensed. He left Normandy and Maine to his eldest son Robert. He wrote to Lanfranc the primate of England, desiring him to crown William king of England. To Henry he bequeathed nothing but the possessions of his mother Matilda; but foretold, that one day he would surpass both his brothers in power and opulence. He expired on the 9th September 1087, in the 63d year of his age, in the 21st of his reign over England, and 54th of that over Normandy.

And of the
king.

William, surnamed *Rufus*, from his red hair, was in Normandy at the time of his father's illness. He no sooner received the letter for Lanfranc, than, leaving his father in the agonies of death, he set out for England; where he arrived before intelligence of the decease of the Conqueror had reached that kingdom. Being sensible that his brother Robert, as being the eldest son, had a preferable title to himself, he used the utmost dispatch in getting himself firmly established on the throne. The English were so effectually subdued, that they made no opposition; but the Norman barons were attached to Robert. This prince was brave, open, sincere, and generous; and even his predominant fault of indolence was not disagreeable to those haughty barons, who affected an almost total independence of their sovereign. The king, on the other hand, was violent, haughty, and tyrannical. A powerful conspiracy was therefore carried on against William; and Odo, bishop of Bayeux, undertook to conduct it. Many of the most powerful nobility were concerned; and

92
William
Rufus.

England. as the conspirators expected to be in a short time supported by powerful succours from Normandy, they retired to their castles, and put themselves in an offensive posture.

William, sensible of his danger, engaged the English on his side, by promising some mitigation of their hardships, and liberty to hunt in the royal forests. Robert, in the mean time, through his natural indolence, neglected to give his allies proper assistance. The conspirators were obliged to submit. Some of them were pardoned; but most of them confiscated, and their estates bestowed on the barons who had continued faithful to the king.

93
Proves a
tyrant.

William, freed from this danger, thought no more of his promises to the English. He proved a greater tyrant than his father; and, after the death of Lanfranc, who had been his preceptor, and kept him within some bounds, he gave full scope to his violent and rapacious disposition. Not content with oppressing the laity, he invaded the privileges of the church; which, in those days, were held most sacred. He seized the temporalities of all the vacant bishoprics and abbeys, and openly put to sale those sees and abbeys which he thought proper to dispose of.

94
Attempts
the con-
quest of
Normandy.

These proceedings occasioned great murmurs among the ecclesiastics, which were quickly spread through the nation, but the terror of William's authority preserved the public tranquillity. In 1090, the king thought himself strong enough to attempt the conquest of Normandy, which at that time was in the greatest confusion through the indolent and negligent administration of Robert. Several of the barons had revolted, and these revolts were encouraged by the king of France. Robert also imagined he had reason to fear the intrigues of his other brother Henry, whom for 3000 merks he had put in possession of *Cotentin*, near a third part of the duchy of Normandy. He therefore threw him into prison; but finding himself threatened with an invasion from the king of England, he gave Henry his liberty, and even made use of his assistance in suppressing the insurrections of his rebellious subjects. William, however, was no sooner landed in Normandy, than the nobility on both sides interposed, and a treaty of peace was concluded. In this treaty Henry finding his interests entirely neglected, retired to St Michael's Mount, a strong fortress on the coast of Normandy, and infested the neighbourhood with his incursions. He was besieged by his two brothers, and obliged to capitulate in a short time; after which, being deprived of all his dominions, he wandered about for some time with very few attendants, and often in great poverty.

The peace with Robert was of no long duration. In the interval some hostilities with Scotland succeeded, and these terminated in the death of Malcolm king of that country; after which new broils ensued with Normandy. The rapacious temper of William prompted him to encroach upon his brother's territories, and the same rapacity prompted him to use a very extraordinary expedient in order to accomplish his designs. Having gone over to Normandy to support his partisans, he ordered an army of 20,000 men to be raised in England, and conducted to the sea-coast as if they were to be immediately embarked: but when they came there, instead of embarking, they were forced to pay the king ten shillings a man; after which they were dismissed to their several

No 116.

counties. With this money William engaged the king of France to depart from the protection of Robert; and also bribed many of the Norman barons to revolt. He was called from Normandy, however, by an irruption of the Welsh; and having repulsed them, he was prevented from attempting other enterprises by a conspiracy of his barons.

In 1096, however, the superstition of Robert put the king of England in possession of those dominions which he had not been able to conquer by force of arms. The crusades were now commenced, and Robert was desirous of undertaking an expedition into the Holy Land. As money for this purpose was wanting, he mortgaged his dominions to his brother for 10,000 merks. The king raised the money by violent extortions on his subjects; forcing even the convents to melt their plate, in order to furnish the quota demanded of them. He was then put in possession of Normandy and Maine; and Robert with a magnificent train set out for the Holy Land.

After the death of Lanfranc, the king had retained in his own hands the revenues of Canterbury, as he had done those of many other bishoprics; but falling into a dangerous illness, he was seized with remorse; and the clergy represented to him that he was in danger of eternal perdition if he did not make atonement for those impieties and sacrileges of which he had been guilty. He therefore instantly resolved to supply the vacancy of Canterbury: he sent for Anselm, a Piedmontese by birth, abbot of Bec in Normandy, who was much celebrated for his piety and devotion. The abbot refused the dignity with great earnestness; fell on his knees, wept, and intreated the king to change his purpose; and when he found him obstinate in forcing the pastoral staff upon him, he kept his fist so hard clenched, that it required the utmost violence of the bystanders to open it, and force him to receive that ensign of his spiritual dignity. William soon after recovered his health, and with it his violence and rapacity. As he now spared the church no more than before, a quarrel with Anselm soon ensued; and this was the more dangerous to the king, on account of the great character for piety which the primate had acquired by his zeal against abuses of all kinds, particularly those of dress and ornament.

At this time there was a mode which prevailed not only in England, but throughout Europe, both among men and women, of giving an enormous length to their shoes, drawing the toe to a sharp point, and affixing to it the figure of a bird's bill, or some such ornament, which was turned upwards, and which was often sustained by gold or silver chains tied to the knee. The ecclesiastics took exception at this ornament, which they said was an attempt to bely the scripture, where it is affirmed, that no man can add a cubit to his stature; and they not only declaimed against it with vehemence, but assembled some synods, in which the fashion was absolutely condemned. Such, however, are the contradictions in human nature, that all the influence of the clergy, which at that time was sufficient to send vast multitudes of people into Asia to butcher one another, was not able to prevail against those long-pointed shoes. The fashion, contrary to what hath happened to almost all others, maintained its ground for several centuries; and even Anselm found his endeavours

96
His quarrel
with the
primate.

England. deavours against it ineffectual. He was more successful in decrying the long hair and curled locks then worn by the courtiers. He refused the ashes on Ash-Wednesday to such as were so accoutred; and his authority and eloquence had such influence, that the young men universally abandoned that ornament, and appeared in the cropt hair recommended to them by the sermons of the primate. For this reformation Anselm is highly celebrated by his historian Eadmer, who was also his companion and secretary.

See An-
selm.

97
Who leaves
the king-
dom.

98
Death of
the king.

When William's profaneness returned with his health, he was engaged in almost perpetual contests with this austere prelate*. These were pretty well settled, when the king, who had undertaken an expedition into Wales, required Anselm to furnish him with a certain number of soldiers. The primate regarded this as an invasion of the rights of the church; and therefore, tho' he durst not refuse compliance, sent the men so miserably accoutred, that the king was exceedingly displeased, and threatened him with a prosecution. Anselm demanded restitution of all his revenues which the king had seized, and appealed to the Pope. The quarrel, however, ran so high that the primate found it dangerous to remain in England. He desired and obtained the king's permission to retire beyond sea. His temporalities were confiscated immediately on his departure; but pope Urban received him as a martyr in the cause of religion, and even threatened the king with sentence of excommunication. William, however, proceeded in his projects of ambition and violence, without regarding the threats of the Pope; who he knew was at that time too much engaged with the crusades to mind any other business. Though his acquisition of Maine and Normandy had brought him into perpetual contests with the haughty and turbulent barons who inhabited those countries, and raised endless tumults and insurrections; yet William seemed still intent on extending his dominions either by purchase or conquest. William Earl of Poitiers and Duke of Guienne had resolved upon an expedition to the Holy Land; and, for this purpose, had put himself at the head of a vast multitude, consisting, according to some historians, of 60,000 horse, and a much greater number of foot. Like Robert of Normandy, he offered to mortgage his dominions for money sufficient to conduct this multitude into Asia. The king accepted his offer; and had prepared a fleet and army to take possession of these dominions, when an unfortunate accident put an end to his projects and his life. He was engaged in hunting, the sole amusement, and indeed the principal occupation, of princes in those rude times. Walter Tyrrel, a French gentleman remarkable for his skill in archery, attended him in this recreation, of which the new forest was the scene. William had dismounted after a chase; and Tyrrel, impatient to show his dexterity, let fly an arrow at a stag which suddenly started before him. The arrow glanced from a tree, and struck the king to the heart. He instantly fell down dead; and Tyrrel, terrified at the accident, clapt spurs to his horse, hastened to the sea-shore, and embarked for France, where he joined the crusade that was setting out from that country. This happened on the 2d of August 1100, after the king had reigned 13 years, and lived about 40. His body was found in

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the woods by the country-people, and buried without ceremony at Winchester.

After the death of William, the crown of right devolved to Robert his eldest brother; for William had no legitimate children. But what Robert had formerly lost by his indolence, he was again deprived of by his absence at the holy war. Prince Henry was in the forest with William Rufus at the time the latter was killed. He no sooner heard the important news, ⁹⁹ Prince Henry u-
surps the crown. than he hurried to Winchester, and secured the royal treasure. William de Breteuil, keeper of the treasure, arrived almost the same instant, and opposed his pretensions; telling him, that the treasure belonged to his elder brother, who was now his sovereign, and for whom he was determined to keep it. But Henry, drawing his sword, threatened him with instant death if he dared to disobey him; and others of the late king's retinue, who came every moment to Winchester, joining the prince's party, he was obliged to desist. Henry lost no time in fully accomplishing his purpose. In less than three days he got himself crowned king of England by Maurice bishop of London. Present possession supplied every deficiency of title; and no one dared to appear in defence of the absent prince.

The beginning of king Henry's reign promised to be favourable to the English liberty; owing chiefly to his fear of his brother. To conciliate the affections of his subjects, he passed a charter calculated to remove many of the grievous oppressions which had been complained of during the reigns of his father and brother. He promised, that at the death of any abbot or bishop, he never would seize the revenues of the see or abbey during the vacancy, but would leave the whole to be reaped by the successor; and that he would never let to farm any ecclesiastical benefice, or dispose of it for money. To the laity he promised, that, upon the death of any earl, baron, or military tenant, his heir should be admitted to the possession of his estate, on paying a just and lawful relief; without being exposed to those enormous exactions which had been formerly required. He remitted the wardship of minors; and allowed guardians to be appointed, who should be answerable for the trust. He promised not to dispose of any heiress in marriage but by advice of all the barons; and if any baron intended to give his daughter, sister, niece, or kinswoman, in marriage, it should only be necessary for him to consult the king, who promised to take no money for his consent, nor ever to refuse permission, unless the person to whom it was proposed to marry her should happen to be his enemy. He granted his barons and military tenants the power of bequeathing by will their money or personal estates; and if they neglected to make a will, he promised that their heirs should succeed to them. He renounced the right of imposing moneyage, and of levying taxes at pleasure, on the farms which the barons kept in their own hands. He made some general professions of moderating fines; he offered a pardon for all offences; and remitted all debts due to the crown. He also required, that the vassals of the barons should enjoy the same privileges which he granted to his own barons; and he promised a general confirmation and observance of the laws of king Edward*. ¹⁰⁰ His charter in favour of the people. To give greater authenticity to these concessions, a

4 H

copy

England. copy of the charter was lodged in some abbey of each county.

101
Quarrels
with the
primate.

† See Feo-
dal Tenure.

King Henry, farther to increase his popularity, degraded and committed to prison Ralph Flambard bishop of Durham, who had been the chief instrument of oppression under his brother. He sent for Anselm, who was then at Lyons, inviting him to return and take possession of his dignities. Anselm returned; but when Henry proposed to him to do the same homage to him which he had done to his brother, the king met with an absolute refusal. During his exile, Anselm had assisted at the council of Bari; where, besides fixing the controversy between the Greek and Latin churches concerning the procession of the Holy Ghost, the right of election to church-preferments was declared to belong to the clergy alone, and spiritual censures were denounced against all ecclesiastics who did homage to laymen for their fees and benefices, and on all laymen who exacted it. The rite of homage † by the feudal customs was, that the vassal should throw himself on his knees, put his joined hands between those of his superior, and should in that posture swear fealty to him. But the council declared it execrable, that pure hands, which could create God, and offer him up for the salvation of mankind, should be put, after this humiliating manner, between profane hands, which, besides being inured to rapine and bloodshed, were employed day and night in impure purposes and obscene contacts. To this decree therefore Anselm appealed; and declared, that so far from doing homage for his spiritual dignity, he would not even communicate with any ecclesiastic who paid that submission, or who accepted of investitures from laymen. Henry durst not insist; and therefore desired that the controversy might be suspended, and that messengers might be sent to Rome to accommodate matters with the Pope, and to obtain his confirmation of the laws and customs of England.

Henry now took another step which seemed capable of confirming his claims to the crown without any danger of a rival. The English remembered with regret their Saxon monarchs, when they compared the liberty they enjoyed under them with the tyranny of the Normans. Some descendants of that favourite line still remained; and among the rest, Matilda, the niece of Edgar Atheling. Upon her the king fixed his eyes as a proper consort, by whose means the breach between the Saxons and Normans might be cemented. A difficulty, however, occurred, because she had been educated in a nunnery. The affair was examined by Anselm in a council of prelates and nobles summoned at Lambeth. Matilda there proved, that she had put on the veil, not with a design of entering into a religious life, but merely in imitation of a custom familiar to the English ladies, who protected their chastity from the brutal violence of the Normans by taking shelter under that habit, which amid the horrid licentiousness of the times was yet generally revered. The council, sensible that even a princess had otherwise no security for her honour, admitted this reason as valid. They pronounced that Matilda was still free to marry; and her nuptials with Henry were celebrated by Anselm with great solemnity and pomp.

102
He marries
Matilda.

While Henry was thus rendering himself popular at home, his brother Robert, who had loitered away a

twelvemonth in Italy, where he married Sibylla daughter of the count of Conversana, arrived in England, in 1101, in order to put in his late and ineffectual claim to the crown. His fame, however, on account of the exploits he had performed in Palestine, was so great, that even yet he was joined by many noblemen of the first rank, and the whole nation seemed prepossessed in his favour. But Henry, having paid his court to Anselm, by his means retained the army in his interests, and marched with them to Portsmouth, where Robert had landed his forces a few days before. The armies lay for some time in sight of each other; when an accommodation was effected through the mediation of Anselm and other great men. By this treaty it was agreed, that Robert should resign his pretensions to England, and receive in lieu of them an annual pension of 3000 marks; that if either of the princes died without issue, the other should succeed to his dominions; that the adherents of each should be pardoned, and restored to all their possessions either in Normandy or England; and that neither Robert nor Henry should thenceforth encourage, receive, or protect, the enemies of each other.

The two princes separated with mutual marks of friendship; but next year, Henry, under various pretences confiscated the estates of almost all the noblemen who had favoured his brother's pretensions. Robert, enraged at the fate of his friends, ventured to come to England in order to remonstrate with his brother in person. But he met with such a bad reception, that, apprehending his liberty to be in danger, he was glad to make his escape by resigning his pension.

This infringement of the treaty was followed the ensuing year by an invasion of Normandy, at the desire of Robert's own subjects, whom he was totally incapable of governing*. The event of this war was the defeat and captivity of Robert, who was henceforth deprived not only of all his dominions, but of his personal liberty. He lived 28 years a prisoner, and died in the castle of Cardiff in Glamorganshire. It is even said by some, that he was deprived of his sight by a red-hot copper-bason applied to his eyes, and that king Henry appeased his conscience by founding the monastery of Reading.

The conquest of Normandy was completed in 1066; and next year the controversy between the king and primate, concerning the investitures of clergymen and their doing homage to princes, was resumed. The king was very sensible that it was not his interest to quarrel with such a powerful body as the clergy were at that time; and on the other hand he fully understood the necessity of guarding the prerogatives of the crown from their encroachments. While, therefore, he avoided an open rupture with Anselm, he obstinately refused to give up the privileges which had been enjoyed by his predecessors. On the first arrival of Anselm, the king had avoided the dispute in the manner already mentioned. A messenger was dispatched to Rome, in order to compromise matters with the Pope. The messenger returned with an absolute refusal of the king's demands. One of the reasons given by the Pope on this occasion, was expressed in the following words: "It is monstrous that a son should pretend to beget his father, or a man to create his God: priests are called

England.
103
Crown of
England
claimed by
Robert.

104
Normandy
invaded by
Henry.

* See Nor-
mandy.

105
Quarrel
with the
primate.

England. called *gods* in scripture, as being the vicars of God: and will you, by your abominable pretensions to grant them their investiture, assume the right of creating them?" Henry was not yet convinced; but as he was determined to avoid, or at least to delay, the coming to any dangerous extremity with the church, he persuaded Anselm, that by farther negociation he should be able to compound matters with the Pope. Messengers were therefore dispatched to Rome a second time from the king; and also from Anselm, who wanted to be fully assured of the Pope's intentions. They returned with letters wrote in the most arrogant and positive manner, both to the king and primate. The king suppressed the letter sent to himself; and persuaded the three bishops, by whom it was sent, to assert, upon their episcopal faith, that the Pope had assured them of his private good intentions towards king Henry, and of his resolution not to resent any future exertion of his prerogative in granting investitures; though he himself scrupled to give this assurance under his hand, lest other princes should copy the example and assume a like privilege. Anselm's two messengers, who were monks, affirmed that it was impossible this story could have any foundation; but their word was not deemed equivalent to that of three bishops; and the king, as if he had finally gained his cause, proceeded to fill the sees of Hereford and Salisbury, and to invest the new bishops in the usual manner. Anselm, however, gave no credit to the assertions of the king's messengers; and therefore refused not only to consecrate them, but even to communicate with them; and the bishops themselves, finding they were become universally odious, returned the ensigns of their spiritual dignity.

The quarrel continued between the king and primate, till the latter, sensible of his dangerous situation, desired leave to make a journey to Rome, in order to lay the case before the Pope. This permission was easily obtained; but no sooner was the primate gone, than Henry confiscated all his revenues, and sent another messenger to negotiate with the Pope. The new messenger told his holiness, that his master would sooner part with his crown than the right of granting investitures. "And I (replied the Pope) would rather lose my head than allow him to retain it." This quarrel now became very dangerous to the king; as he was threatened by the Pope with excommunication, which would have been attended with terrible consequences. At last, however, a compromise was made in the following manner. Before bishops took possession of their dignities, they had formerly been accustomed to pass through two ceremonials: They received, from the hands of the sovereign, a ring and crozier as the symbols of their office, and this was called their *investiture*: they also made those submissions to the prince, which were required of the vassals by the rites of the feudal law, and which received the name of *homage*. The Pope, therefore, was for the present contented with Henry's resigning his right of granting investitures, by which the spiritual dignity was supposed to be conferred; and he allowed the bishops to do homage for their temporal properties and privileges. After this, the Pope allowed Anselm to communicate with the prelates who had already received investitures from the crown; and he only required of them some

submissions for their past conduct. He also granted to Anselm a plenary power of remedying every disorder, which he said might arise from the barbarousness of the country. About the same time the marriage of priests was prohibited; and even laymen were not allowed to marry within the seventh degree of affinity. By this contrivance the Pope augmented the profits which he reaped from granting dispensations, and likewise those from divorces. For as the art of writing was then rare, and parish-registers were not regularly kept, it was not easy to ascertain the degrees of affinity even among people of rank; and any man who had money to pay for it, might obtain a divorce, on pretence that his wife was more nearly related to him than was permitted by the canons. A decree was also published, prohibiting the clergy to wear long hair; and the king, tho' he would not resign his prerogatives to the church, very willingly cut his hair in the form which was required of him, obliging all the courtiers at the same time to follow his example.

From the time of this compromise, which happened in 1107, to the year 1120, nothing remarkable happened except some slight commotions in Normandy: but this year, prince William, the king's only son, was unfortunately drowned off the coast of Normandy; and Henry was so much affected, that he is said never afterwards to have smiled or recovered his wonted cheerfulness. It is very doubtful, however, whether the death of this prince was not an advantage to the British nation, since he was often heard to express the utmost hatred to the natives; insomuch that he had threatened, that when he came to the throne, he would make them draw the plough, and would turn them into beasts of burden. These prepossessions he inherited from his father; who, though he was wont, when it might serve his purposes, to value himself on his birth as a native of England, showed, in the course of his government, an extreme prejudice against that people. All hopes of preferment to ecclesiastical as well as civil dignities are denied to the English during this whole reign; and any foreigner, however ignorant or worthless, was sure to have the preference in every competition. The charter formerly mentioned, which the king granted at the beginning of his reign, was no more thought of; and the whole fell so much into neglect and oblivion, that in the following century, when the barons, who had heard an obscure tradition of it, desired to make it the model of the great charter which they exacted from king John, they could only find one copy of it in the whole kingdom; while the grievances, proposed to be redressed by it, continued still in their full extent.

As Henry had now no legitimate children except Matilda, whom in 1110 he had betrothed, though only eight years of age, to the emperor of Germany, he was induced to marry a second time in hopes of having sons. He made his addresses accordingly to Adelais the daughter of Godfrey Duke of Lovaine, and niece to Pope Calixtus; a young princess of an amiable person. But Adelais brought him no children: and in 1135, the king died in Normandy, from eating too plentifully of lampreys; having lived 67 years, and reigned 35.

By the will of king Henry, his daughter Matilda became heiress of all his dominions. She had been

England. married, after her first husband's death, to Geoffrey Plantagenet eldest son of the count of Anjou, by whom she had a son named *Henry*; but as Geoffrey had given umbrage to the king of England in several instances, no notice was taken of him in the will. The nobility had already sworn fealty to her; and the foremost to show this mark of submission to the king's will had been Stephen, son of the count of Blois (who had married Adela the daughter of William the Conqueror). He had been married to Matilda daughter and heiress of Eustace Count of Boulogne; who brought him, besides that feudal sovereignty of France, a vast property in England, which in the distribution of lands had been conferred by the Conqueror on the family of Boulogne. By this marriage Stephen acquired a new connection with the royal family of England: for Mary, his wife's mother, was sister to David the present king of Scotland, and to Matilda the first wife of Henry and mother of the empress. The king also, imagining that by the aggrandizement of Stephen he strengthened the interest of his own family, had enriched him with many possessions; but instead of this, it appeared by the event that he had only put it more and more in his power to usurp the throne.

108
Stephen u-
surps the
throne.

No sooner was Henry dead, than Stephen hastened from Normandy into England. The citizens of Dover and Canterbury, apprized of his purpose, shut their gates against him; but when he arrived at London, some of the lower class of people, instigated by his emissaries, immediately proclaimed him king. The archbishop of Canterbury refused to give him the royal unction; but this difficulty was got over by Stephen's brother the bishop of Winchester. Hugh Bigod, steward of the household, made oath before the primate, that the late king, on his death-bed, had discovered a dissatisfaction with his daughter Matilda, and had expressed his intention of leaving the Count of Boulogne heir to all his dominions; and the bishop, either believing, or pretending to believe, this testimony, gave Stephen the royal unction. Very few of the nobility attended his coronation; but none opposed his usurpation, however unjust or flagrant.

Stephen, in order to establish himself on the throne as firmly as possible, passed a charter, in which he made liberal promises to all ranks of men. To the clergy he promised, that he would speedily fill all the vacant benefices, and never would levy any of the rents during the vacancy. To the nobility he gave liberty to hunt in their own forests; and to the people he promised to remit the tax of danegelt, and to restore the laws of Edward the Confessor. He seized the king's treasure at Winchester, amounting to L. 100,000; with part of which money he hired mercenary soldiers from the continent; and with another part procured a bull from the Pope, confirming his title to the English throne.

Matilda, in the mean time, endeavoured to recover her just rights of which Stephen had deprived her; but for some time she met with no success either in England or Normandy. Her husband Geoffrey himself was obliged to conclude a peace with Stephen, on condition of the king's paying him during that time an annual pension of L. 5000.

Robert Earl of Gloucester was the first who shook the power of Stephen. He was natural son to the late

king; a man of great honour and ability, and was very much attached to the interests of Matilda. When Stephen usurped the throne, he offered to do him homage, and take the oath of fealty; but with an express condition, that the king should maintain all his stipulations, and never invade any of Robert's rights or dignities. With this condition Stephen was obliged to comply, on account of the great power of that nobleman, though he knew that it was meant only to afford him a favourable opportunity of revolting when occasion served. The clergy imitated Robert's example; and annexed to their oath of allegiance the following condition, namely, that they were only bound as long as the king defended the ecclesiastical liberties, and supported the discipline of the church. The barons, in return for their submission, exacted terms of still more pernicious tendency. Many of them required to have the right of fortifying their castles, and putting themselves in a posture of defence; and with this exorbitant demand the king was forced to comply. All England was immediately filled with these fortresses; which the noblemen garrisoned either with their vassals, or with licentious soldiers, who flocked to them from all quarters. The whole kingdom now became a scene of rapine and devastation. Wars were carried on by the nobles in every quarter; the barons even assumed the right of coining money, and of exercising, without appeal, every act of jurisdiction; and the inferior gentry, as well as the people, finding no defence from the laws, during this total dissolution of sovereign authority, were obliged, for their immediate safety, to pay court to some neighbouring chieftain, and to purchase his protection, both by submitting to his exactions, and by assisting him in his rapine upon others.

109
Distracted
state of the
kingdom.

In 1137, the Earl of Gloucester having projected an insurrection, retired beyond sea, sent the king a defiance, and solemnly renounced his allegiance. The next year David king of Scotland appeared with an army in defence of his niece's title; and penetrating into Yorkshire, committed the greatest devastations. He was defeated, however, with great slaughter, at Northallerton, by some of the northern barons, who had raised a powerful army; and this success so much overawed the malecontents in England, that Stephen's power might have received some stability, had he not unfortunately engaged himself in a contest with the clergy. He had already seen the mischief arising from the liberty he had granted of fortifying so many castles in different parts of the kingdom. He therefore determined to abridge this liberty as much as possible; and for that purpose he began with the castles erected by the clergy, who seemed to have less right to these military securities than the barons. Taking advantage therefore of a fray which had arisen at court between the retinue of the bishop of Salisbury and the Earl of Brittany, he seized the bishops both of Salisbury and Lincoln, threw them into prison, and obliged them to deliver up the castles which they had lately erected. This produced such a violent commotion, that the opportunity seemed favourable to the pretensions of Matilda. On the 22d of September 1139, she landed in England with Robert Earl of Gloucester, attended only by 140 knights; but her partizans daily increased, and she was soon in a condition to face Stephen

110
Matilda
lands in
England.

England. phen with equal forces in the field. Numberless encounters happened, the detail of which could afford very little entertainment to the reader. War was spread through every quarter; and the turbulent barons having, in a great measure, shaken off all restraint of government, and now obtained the sanction of fighting in the cause of their country, redoubled their oppressions, tyrannies, and devastations. The castles of the nobility became receptacles of licensed robbers; who, sallying forth day and night, spoiled the open country, plundered the villages, and even cities. They tortured the captives to make them reveal their treasures; sold their persons to slavery; and set fire to the houses, after they had pillaged them of every thing valuable. In consequence of this destruction, the land was left untilld; the instruments of husbandry were abandoned; and a grievous famine reduced the nation to the most deplorable state that can be imagined.

111
Stephen de-
feated and
taken pri-
soner.

After a multitude of indecisive conflicts, a battle ensued which seemed likely to ensure the public peace for some time. Stephen had marched his forces to relieve the city of Lincoln; the Earl of Gloucester led a body of troops to assist those of Matilda's party, who were besieging that place. The two armies engaged on the 2d of February within sight of the city, and a desperate battle ensued. At last Stephen's army was defeated. He himself was for some time left without attendants; and fought on foot in the midst of his enemies, assaulted by multitudes, and resisting all their efforts with astonishing intrepidity. Being hemmed in on every side, he forced a way for some time with his battle-ax; but that breaking, he drew his sword, and with it furiously assailed his antagonists for some time longer. But at length the sword also flying in pieces, he was obliged to surrender himself a prisoner. He was conducted to Gloucester; and though at first treated with respect, he was in a short time, upon some suspicions, thrown into irons.

112
Matilda
crowned.

About a month after, Matilda was crowned at Winchester with great solemnity; but soon showed herself totally incapable of governing such a turbulent nation. She determined to repress the power of the nobles, who had now left only the shadow of authority to their sovereign. But being destitute of policy or prudence sufficient to accomplish so difficult an undertaking, a conspiracy was soon formed against her, and the bishop of Winchester detached a party of his friends and vassals to block up the city of London where the queen resided. At the same time measures were taken to instigate the Londoners to a revolt, and to seize the queen's person. Matilda, having timely notice of this conspiracy, fled to Winchester. Here she was soon after besieged by the bishop: but the town being distressed by famine, she with difficulty made her escape; while her brother the Earl of Gloucester, endeavouring to follow, was taken prisoner, and exchanged for Stephen.

113
Stephen
restored.

Matilda was now obliged to take shelter in Oxford, while Stephen reascended the throne. The civil war broke out with redoubled fury. Many battles were fought, and both parties were involved in many distresses. Matilda escaped from Oxford at a time when the fields were covered with snow, by being dressed all in white, with four knights her attendants dressed in the same colour. Another time Stephen was surprised

England. by the earl of Gloucester at Wilton, and made his escape with the utmost difficulty. At last Matilda was obliged to quit the kingdom; and the death of the earl of Gloucester soon after seemed to give a fatal blow to her interests. In 1153, however, prince Henry, Matilda's son by her second husband Geoffrey, came over to England, in order once more to dispute Stephen's pretensions to the crown. After some success on his first landing, he was opposed by Stephen with a powerful army, and matters seemed likely to come to the decision of a general engagement. But while the two armies continued within a quarter of a mile of each other, a treaty was set on foot by the interposition of William earl of Arundel, for terminating the dispute in an amicable manner. The death of Eustace, Stephen's son, whom he had designed for the throne, which happened during the course of the treaty, facilitated its conclusion. It was agreed, that Stephen should reign during his life, and that justice should be administered in his name; that Henry, on Stephen's death, should succeed to the kingdom; and that William, Stephen's son, should inherit Boulogne and his patrimonial estate. This treaty filled all Europe with joy; and after the barons had sworn to it, Henry left England, and Stephen returned to the peaceable enjoyment of his throne. His reign, however, was but of short continuance; his death happening on the 25th of October 1154.

114
His death.

Henry was on the continent besieging a castle of one of the mutinous barons, when news was brought him of Stephen's death. But, as he was sensible of the goodness of his title, he did not abandon his enterprize till the place was reduced. He then set out on his journey, and was received in England with the utmost joy. The first acts of his reign seemed to promise an happy and prosperous administration. He instantly dismissed the mercenary soldiers who had committed the greatest disorders throughout the nation. He ordered all the castles which had been erected since the death of Henry I. to be demolished, except a few which he retained in his own hands for the protection of the kingdom. The adulterated coin which had been struck during the reign of Stephen was cried down, and new money struck of the right value and standard. He resumed many of those benefactions which had been made to churches and monasteries in the former reigns. He gave charters to several towns, by which the citizens claimed their freedom and privileges independent of any superior but himself. These charters were the ground-work of the English liberty; for thus a new order, namely, the more opulent of the people, began to claim a share in the administration, as well as the nobility and clergy. Thus the feudal government was at first impaired; and liberty began to be more equally diffused throughout the nation.

115
Henry II.

Henry II. on his accession to the English throne, found himself possessed of very extensive dominions on the continent. In the right of his father, he possessed Anjou, Touraine, and Maine; in that of his mother, Normandy; in that of his wife, Guienne, Poictou, Xaintogne, Auvergne, Perigord, Angoumois, and the Limousin. Soon after, he annexed Brittany to his other states, by marrying his son, who was yet a child, to the heiress of Brittany, who was a child also,

England. also, and was already in possession of the superiority over that province. These territories composed above a third of the French monarchy, and were by far the most opulent part of it; so that Henry, though vassal to the king of France, was greatly superior to him in power: and when England was added to all these, the French king had great reason to apprehend some disaster to himself and family. The king of England, however, resided at too great a distance to be able to employ this formidable power with success against the French monarch. He soon became a kind of stranger in his continental dominions; and his subjects there considered their allegiance as more naturally due to their superior lord, who lived in their neighbourhood, and who was acknowledged to be the supreme head of their nation. Their immediate lord was often at too great a distance to protect them; and a commotion in any part of Henry's extensive dominions gave great advantages against him. The wise and vigorous administration of Henry, however, counterbalanced in a great measure these disadvantages; and he maintained a surprising tranquillity throughout his extensive dominions during the greatest part of his reign.

• See (Benefit of) Clergy. 116
Monstrous wickedness of the clergy.

117
Contests of the king with Thomas a Becket.

Henry found no great difficulty in circumscribing the power of the barons; but when he attempted to do the same thing with the clergy, he met with the most violent opposition. That body had carried their independence on the civil power so far, that now they seemed to aim at nothing less than a liberty to commit all manner of crimes with impunity. During the reign of Stephen, they had extorted an immunity from all but ecclesiastical penalties*; and that grant they were resolved to maintain for the future. It may easily be supposed, that a law which thus screened their wickedness, contributed to increase it; and we accordingly find upon record, not less than 100 murders committed by men in holy orders, in the short period since the king's accession, not one of which was punished even with degradation; while the bishops themselves seemed to glory in this horrid indulgence. The king did not make any attempts against them during the life of Theobald archbishop of Canterbury, who was a man of a mild character, and besides had great merit; because, during the former reign, he had refused to put the crown on the head of Eustace, Stephen's son. He died in 1162; and the king, after his death, advanced to the see of Canterbury Thomas a Becket, his chancellor, on whose compliance he thought he might entirely depend.

The new archbishop was the first man of English pedigree, who, since the Norman conquest, had risen to any considerable station. Before his instalment in the see of Canterbury, Becket had been exceedingly complaisant, good-humoured, and agreeable to his master; and had also been accustomed to live very freely. But no sooner was he invested with this high dignity, than he totally altered his conduct, and put on all those airs of affected and ostentatious humility which could recommend him to the superstitious and ignorant multitude in that age. The first step taken by this hypocrite after his advancement, was to resign the office of chancellor. This he did without consulting the king: the reason he gave was, that henceforth he must detach himself from secular affairs, and be solely employed in the duties of his sacred function;

but in reality, that he might break off all connexion with Henry. As he knew that the king intended to abridge the ecclesiastical power, he thought the best method would be to become himself the aggressor. He therefore summoned the earl of Clare to surrender the barony of Tunbridge; which, ever since the Conquest, had remained in the family of that nobleman; but which, as it had formerly belonged to the see of Canterbury, the primate pretended that his predecessors were prohibited by the canons from alienating.—William de Eynsford, a military tenant of the crown, was patron of a living which belonged to a manor that held of the archbishop of Canterbury; and Becket, without regard to William's right, presented, on a new and illegal pretence, one Laurence to that living, who was violently expelled by Eynsford. Upon this, Eynsford was excommunicated. He complained to the king, that he, who held *in capite* of the crown, should, contrary to the practice established by the Conqueror and maintained ever since by his successors, be subjected to that terrible sentence, without the previous consent of the sovereign. Henry, by a messenger, commanded Becket to absolve Eynsford. The haughty primate answered, that it belonged not to the king to inform him whom he should absolve, and whom excommunicate; but, after all, he was obliged to comply with the king's orders, though with the worst grace imaginable.

As Henry perceived that the crown was now in danger, through the superstition of the people, of falling totally under the power of the clergy, he resolved to exert himself to the utmost against their scandalous usurpations. Among their other inventions to obtain money, they had now inculcated the necessity of penance as an atonement for sin; and having again introduced the practice of paying them large sums as an equivalent for these penances, the sins of the people had thus become a revenue to the priests; and the king computed, that, by this invention alone, they levied more money from his subjects than what flowed by all the funds and taxes into the royal exchequer. To ease the people of so heavy and arbitrary an imposition, the king required, that a civil officer of his appointment should be present in all ecclesiastical courts, and should for the future give his consent to every composition made for spiritual offences. About this time also the king had an opportunity of proceeding against the clergy on another footing. A clerk in Worcestershire, having debauched a gentleman's daughter, murdered her father. The king required that the clerk should be delivered up to the magistrate. Becket pleaded the privileges of the church; confined the criminal in the bishop's prison, lest he should be seized by the king's officers; and maintained that no greater punishment could be inflicted on him than degradation. The king then required, that, immediately after he was degraded, he should be tried by the civil powers; but the primate asserted, that it was iniquitous to try a man twice upon the same accusation, and for the same crime. Upon this, Henry summoned an assembly of all the prelates in England; and put to them this decisive question, Whether or not they were willing to submit to the ancient laws and customs of the kingdom? The bishops unanimously replied, that they were willing, *saving their own order*. The king was

England. provoked to the last degree at this equivocal answer. He left the assembly with evident marks of displeasure; and required the primate instantly to surrender the castles of Eye and Berkham. The other prelates were terrified; but Becket continued inflexible: however, he was at last prevailed upon, by the interposition of Philip the pope's legate and almoner, to retract the saving clause, and promise without any reserve to observe the ancient customs.

The king was not now to be satisfied with general promises from the clergy. He was determined that the ancient laws and customs should be defined, as well as the privileges of the clergy. He therefore summoned another great council of the clergy and nobility at Clarendon, to whom he submitted this important affair. A number of regulations was there drawn up, which were afterwards well known by the title of the *Constitutions of Clarendon*. By these it was enacted, that clergymen accused of any crime should be tried in the civil courts; that laymen should not be tried in spiritual courts, except by legal and reputable witnesses; that the king should ultimately judge in ecclesiastical and spiritual appeals; that the archbishops and bishops should be regarded as barons, and obliged to contribute to the public expences like other persons of their rank; that the goods forfeited to the king, should not be protected in churches or church-yards by the clergy; and that the sons of villeins should not take orders without the consent of their lord. These, with some others of less consequence, to the number of 16, were subscribed by all the bishops present, and even by Becket himself; who, at first, showed some reluctance.

Nothing now remained but to get the constitutions ratified by the Pope; but in this the king was disappointed. The Pope rejected them with the utmost indignation; and, out of 16, admitted only six, which he thought were not important enough to deserve censure.—Becket was now mortified to the highest degree. He retracted his consent to the constitutions, redoubled his austerities, and even refused to execute any part of his sacerdotal function till he had obtained absolution from his holiness. Henry, considering these humilities as insults offered to himself, desired the Pope to send him a legate. He did so; but annexed a clause to his commission, by which he was prohibited from acting against the archbishop of Canterbury. The king sent back the commission to the Pope; and being now exasperated beyond all patience, commenced furious prosecutions against Becket. He first sued him for some lands belonging to his primacy; and Becket being detained by sickness from coming into court, his non-attendance was construed into disrespect. The primate afterwards defended his cause in person; but all his goods and chattels were confiscated, and the bishop of Winchester was obliged to pronounce the sentence. Another suit was commenced against him for L. 300, which he had levied on the honours of Eye and Berkham, and the primate agreed to give securities for the payment of the sum. The next day a third suit was commenced against him for 1000 marks, which the king had lent him upon some former occasion: and, immediately upon the back of these, a still greater demand was made; namely, that Becket should give an account of the money he had received

and expended during the time he was chancellor. The money was computed at no less than 40,000 marks; and the primate, unable either to give an account, or find securities, took the following extraordinary method of evading the king's designs. He arrayed himself in his episcopal vestments; and with the cross in his hand, went forward to the palace. Having entered the royal apartments, he sat down, holding up the cross as his banner and protection. The king, who sat in an inner apartment, ordered by proclamation all the prelates and nobility to attend him; to whom he loudly complained of Becket's insolence. The whole council joined in condemning this instance of his unaccountable pride; and determined to expostulate with him about his inconsistency concerning the constitutions of Clarendon. But all their messages, threats, and arguments, were to no purpose. Becket put himself, in the most solemn manner, under the protection of the supreme pontiff, and appealed to him against any penalty which his iniquitous judges might think proper to inflict. Then leaving the palace, he asked the king's immediate permission to quit Northampton; but being refused, he secretly withdrew in disguise, and at last found means to cross over to the continent.

Becket was received with the greatest marks of esteem, first by the king of France (who hated Henry on account of his great power), and then by the Pope, whose cause he had so strenuously defended in England. Henry at the same time sent ambassadors to the Pope, who were treated with coolness and contempt, while Becket was honoured with the greatest marks of distinction. These favours bestowed upon an exile and a perjured traitor (for such had been Becket's sentence of condemnation in England), irritated the king to such a degree, that he resolved to throw off at once all dependence upon the Pope. He accordingly issued out orders to his justiciaries; inhibiting, under severe penalties, all appeals to the Pope or the archbishop; and forbidding any of them to receive mandates from them, or to apply to their authority. He declared it treasonable to bring over from either of them any interdict upon the kingdom. This he made punishable in secular clergymen by the loss of their livings, and by castration; in regulars, by the amputation of their feet; and in laymen, by death. On the other hand, the Pope and the archbishop did not fail to issue forth their fulminations in such a manner as to shake the very foundation of the king's authority. Becket excommunicated by name all the king's chief ministers who had been concerned in sequestrating the revenues of his see, and all who obeyed or favoured the constitutions of Clarendon. He even threatened to excommunicate the king if he did not speedily repent; and had not the Pope himself been threatened every day with the machinations of an antipope, whose pretensions he was afraid the king of England might support, the sentence of excommunication would certainly have been denounced.

At first, Henry paid little regard to these fulminations; but afterwards, when he found that his authority over his subjects began to decline on that account, and that his rivals on the continent were endeavouring to disturb the tranquillity of his dominions, he began sincerely to desire a reconciliation. This the Pope and

Becket

England.

118:
Becket flies
to the con-
tinent.

England. Becket also became desirous of, because they saw that their utmost endeavours were insufficient to draw Henry's subjects into a revolt against him. The treaty of accommodation, however, was often broke off, through the extreme jealousy of each of the parties; but at length, by the mediation of the Pope's legate, all differences were adjusted, and Becket was reinstated in the see of Canterbury.

119

Is restored,
and behaves
with his
former in-
solence.

On the recovery of his dignity, the primate behaved with all his usual arrogance. Instead of retiring quietly to his diocese when he landed in England, he made a progress through Kent with all the splendor and magnificence of a sovereign pontiff. As he approached Southwark, the clergy, the laity, and all ranks of people, came forth to meet him, and celebrated his triumphal entry with hymns of joy. Being thus confident of the support of the people, he resolved to make his enemies feel the severest effects of his vengeance. He suspended the archbishop of York, who had crowned Henry's eldest son in his absence. He excommunicated the bishops of London and Salisbury, with some of the principal nobility and prelates who had assisted at the coronation. One man he excommunicated for having spoken against him, and another for having cut off the tail of one of his horses. The excommunicated and degraded prelates immediately made their complaints to the king; and he having dropped some passionate expressions, intimating a desire to have Becket's life taken away, the supposed will of the king was instantly accomplished; nor could the king's express orders to the contrary arrive time enough to hinder the execution of this fatal purpose. See BECKET.

120

Grief of the
king for his
death.

The king was thrown into the utmost consternation on hearing of Becket's murder. He knew that the primate's death would accomplish what his most violent opposition during his life could never have done, and therefore he gave himself up to sorrow; for three days he even refused all nourishment; till at last his courtiers were obliged to break in upon his solitude, and induce him to acquiesce in an event which could not possibly be recalled. The pope was with some difficulty made sensible of the king's innocence; but refused to grant him a pardon, except on condition that he should make every future submission and perform every injunction the holy see thought proper to demand. When things were thus adjusted, the assassins who had murdered Becket were allowed to retire in safety to the enjoyment of their former dignities; and the king, with a view to divert the minds of the people to a different object, undertook an expedition into Ireland, and totally reduced that island. See IRELAND.

121

Dissensions
in Henry's
family.

The king was scarce freed from the war with Ireland, and the dangerous controversy which he had engaged in with the church of Rome, when he found himself involved in the most unnatural contests with his children, to whom he had always behaved in the most tender and affectionate manner. He had ordered Henry his eldest son to be anointed king; and had destined him for his successor in the kingdom of England, the duchy of Normandy, and the counties of Anjou, Maine, and Touraine; territories which lay contiguous, and which might thus easily lend their assistance to one another. Richard his second son

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was invested in the duchy of Guienne and county of Poitou: Geoffrey, his third son, inherited, in right of his wife, the duchy of Brittany: and the new conquest of Ireland was destined for the appendage of John his fourth son, for whom he had negotiated a marriage with Adalais the only daughter of Humbert count of Savoy and Maurienne; and with whom he was to receive as a dowry very considerable demesnes in Piedmont, Savoy, Bresse, and Dauphiny. This greatness of Henry's family alarmed the king of France; and he therefore excited young prince Henry to demand of his father, either the immediate resignation of the crown of England, or the duchy of Normandy. The king refused to comply with such an extravagant demand; upon which the prince made his escape to Paris, where he was protected by the French king. This happened in 1173; and the same year, queen Eleanor, finding that she was now grown very disagreeable to the king, communicated her discontent to her two younger children Geoffrey and Richard, whom she engaged also to demand the territories assigned them, and then fly to the court of France. The queen herself was meditating an escape to the same court, and had put on man's apparel for that purpose, when she was seized and confined by Henry's order. The licentious barons in the mean time wished for a change of government; hoping to have liberty, under young and unexperienced princes, to commit those rapines and violences which they could not do with safety when governed by such a prudent and vigilant king as Henry. In the midst of this universal defection, however, the English monarch still retained his usual intrepidity, and prepared with as much vigour as possible for the contest. As he could depend on the fidelity of very few of his nobility, he was obliged to enlist in his service a number of desperate ruffians called *Brabengons*, and sometimes *Routiers* or *Cottereaux*, though for what reason is not mentioned in history. These banditti were very numerous during the times of the feudal government, when many private wars were carried on between the nobles; and 20,000 of these, with a few forces furnished by his faithful barons, composed the whole of Henry's army on this occasion.

With this force the king of England totally overthrew the schemes of his enemies on the continent; but being very desirous of putting an end to the war, he this very year (1173) agreed to a conference with the king of France. At this interview, Henry offered his children the most advantageous terms. He insisted only on retaining the sovereign authority in all his dominions. To Henry he offered half the revenues of the crown of England, with some places of surety in that kingdom; or if he chose rather to reside in Normandy, half the revenues of that duchy, with all those of Anjou. He made a like offer to Richard in Guienne; he promised to resign all Brittany to Geoffrey; and if these concessions were not deemed sufficient, he agreed to add to them whatever the Pope's legates, who were present, should require of him. The conference, however, was broke off by the violence of the earl of Leicester; who not only reproached Henry in the most indecent manner, but even put his hand to his sword, as if he intended to attempt some violence against him.

122

Queen E-
leanor con-
fined.

1a

England.

In the mean time, the most of the English nobility united in opposition against their sovereign; and an irruption at this time by the king of Scotland assisted their rebellious schemes. The earl of Leicesther soon after invaded Suffolk at the head of a body of Flemings; but they were repulsed with great slaughter, and the earl himself was taken prisoner. Soon after, William king of Scotland, who had been repulsed, and agreed to a cessation of arms, broke the truce, and invaded England with an army of 80,000 men, committing the most terrible devastations. Henry in the mean time, to reconcile himself thoroughly to the church, performed the penances at the tomb of Thomas a Becket which he had formerly promised to do. As soon as he came within sight of the church of Canterbury, he alighted from his horse, walked barefoot towards the town, and prostrated himself before the shrine of the saint. He remained a whole day in prayer and fasting, watched the holy relics all night, made a grant of 50l. a-year to the convent for a constant supply of tapers to illuminate the shrine; and not satisfied with these submissions, he assembled a chapter of monks, disrobed himself before them, put a scourge into each of their hands, and presented his bare shoulders to their strokes. Next day he received absolution; and, departing for London, had the agreeable news of the defeat and captivity of William king of Scotland, which happened on the very day of his absolution.

123
King of
Scotland
defeated
and taken
prisoner.

This victory proved decisive in Henry's favour. The English barons who had revolted, or were preparing for a revolt, instantly delivered up their castles to the victor, and the kingdom was in a few weeks restored to perfect tranquillity. Prince Henry, who was ready to embark with a great army to join the English rebels, abandoned all thoughts of the enterprise. Soon after a treaty was concluded with the king of France; in which Henry granted his children much less advantageous terms than he had offered them before. The principal were, some pensions for their support, castles for their residence, and an indemnity to all their adherents. The greatest sufferer by this war was William king of Scotland. He was compelled to sign a treaty, by which he obliged himself to do homage to Henry for the kingdom of Scotland. It was agreed, that his barons and bishops should do the same; and that the fortresses of Edinburgh, Stirling, Berwick, Roxburgh, and Jedburgh, should be delivered into the hands of the conqueror till the articles were performed. This treaty was executed most punctually and rigorously on the 10th of August 1175. The king, barons, and prelates of Scotland, did homage to Henry in the cathedral of York; the greatest humiliation to which the Scottish nation had ever been subjected.

124
Owns him-
self Henry's
vassal.

125
New dissen-
sions in
Henry's fa-
mily.

Henry was now freed from all troubles either at home or abroad, for five years; during which time he made several salutary laws for the good of his kingdom. But, in 1180, the ambitious spirits of his children involved him in fresh calamities. Richard, who had been invested by his father with the sovereignty of Guienne, refused to do homage to his elder brother, as king Henry had required him to do. Young Henry and Geoffrey, uniting their arms, invaded their brother's dominions; and while the king was endeavour-

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ing to compose their differences, he found himself conspired against by them all. The conspiracy, however, was defeated by the death of prince Henry in 1183. He had retired to Martel, a castle near Turenne, where he was seized with a fever; and perceiving the approaches of death, he was at last struck with remorse for his undutiful behaviour towards his father. He sent a messenger to the king, who was not far distant; expressed his contrition for his faults; and intreated the favour of a visit, that he might at least die with the satisfaction of having received his forgiveness. The king, who had so often experienced his son's ingratitude and violence, apprehended that his sickness was entirely a feint, and dared not trust himself in the prince's hands. But soon after, receiving certain intelligence of his death, and proofs of his sincere repentance, the good old king was affected with the deepest sorrow. He thrice fainted away; he accused his own hard-heartedness in refusing the dying request of his son; and he lamented that he had deprived the prince of the last opportunity of making atonement for his offences.

Prince Henry, who died in the 28th year of his age, left no posterity. His brother Richard succeeded to his dominions, and soon discovered as turbulent a spirit as that which had actuated his brother. He refused to give up Guienne, which Henry had designed for his fourth son John; and even made preparations for carrying on war against his father, and brother Geoffrey. Henry sent for Eleanor his queen, the heiress of Guienne; to whom Richard, either dreading an insurrection in her favour, or out of a sense of duty, willingly yielded up the territory, and retired peaceably to his father's court. This breach, however, was no sooner made up, than Geoffrey, demanded Anjou to be added to his dominions in Brittany. This the king refused; upon which he fled to the court of France, and prepared to levy an army against his father. Henry, however, was freed from the danger which threatened him from that quarter, by his son's death, who was killed in a tournament at Paris. The loss of this prince gave few, except the king himself, any uneasiness; for he was universally hated, and went among the people by the name of the *Child of Perdition*. The widow of Geoffrey, soon after his decease, was delivered of a son, who received the name of *Arthur*, and was invested in the duchy of Brittany, under the guardianship of his grandfather, who, as duke of Normandy, was also superior lord of that territory. Philip, as lord paramount, disputed for some time his title to this wardship; but was obliged to yield to the inclinations of the Bretons, who preferred the government of Henry. Some other causes inflamed the dissension between these two monarchs, and Philip once more seduced Richard from his duty. He insisted, that his marriage with Adelais, Philip's sister, should be immediately completed, and threatened to enforce his pretensions with a formidable army. This occasioned another conference between Gisors and Trie, the usual place of meeting, under a vast elm that is said to have shaded more than an acre. In the midst of this conference the archbishop of Tyre appeared before the assembly in the most miserable habit, and begged assistance against the infidels, who, under Saladin, had almost totally expelled the Christians from Asia. His intelli-

England.

England. gence appeared so very dismal, that the kings of France and England laid aside their animosity. Both of them immediately took the cross; but Richard, who had long wished to have all the glory of such an expedition to himself, could not bear to have even his father for a partner in his victories. He therefore entered into a confederacy with the king of France; so that Henry found himself at last obliged to give up all thoughts of the crusade, in order to defend himself against this unnatural combination. The event of the war proved very unfortunate for Henry, who lost several towns, and narrowly escaped falling into the hands of the enemy himself. At last a treaty was concluded at the intercession of the duke of Burgundy, the count of Flanders, and the archbishop of Rheims; but upon terms very humiliating to the king of England. It was agreed, that Richard should marry the princess Adelais, and be crowned king of England during the lifetime of his father; that Henry should pay 20,000 marks to the king of France, as a compensation for the charges of the war; that his own barons should engage to make him observe this treaty, and in case of violating it, to join Philip and Richard against him; and that all his vassals who had espoused the cause of Richard should receive an indemnity for their offence. These terms, mortifying as they were, Henry bore with patience; but when, upon receiving a list of the barons that were to be pardoned, he found his own son John, who was his favourite, among them, he could no longer support his grief. He broke out into the most lamentable expressions of despair; cursed the day in which he received his miserable being; and bestowed on his ungrateful children a malediction which he could never afterwards be prevailed upon to retract. Soon after, he fell into a lingering fever occasioned by his grief; and of this he died on the 6th of July 1189, in the 58th year of his age and 35th of his reign. His natural son Geoffrey, who alone had behaved dutifully towards him, attended his corpse to the nunnery of Fontevrault, where it lay in state in the abbey-church. Next day Richard, who came to visit the dead body of his father, was struck with horror at the sight. At his approach, the blood was seen to gush out at the mouth and nostrils of the corpse; and this accident was, by the superstition of the times, interpreted as the most dreadful rebuke. Richard could not endure the sight. He exclaimed that he was his father's murderer; and expressed a strong, though too late, sense of his undutiful conduct.

126
His extreme grief and death.

127
Richard I.

128
Massacre of the Jews.

Richard succeeded to the throne without opposition, immediately after his father's death; and, on his accession, set his mother Eleanor (who had been again confined) at liberty. A romantic desire for strange adventures, and an immoderate zeal for the external rites of religion, were the ruling passions of the times. By the first of these Richard was inflamed to the highest degree, and therefore behaved as if the whole design of his government had been to attempt the recovery of the Holy Land from the Infidels. The superstition of the people showed itself in a most violent and tragical manner on the very day of the king's coronation. The Jews were the objects of universal hatred, so that Richard had issued out orders forbidding any of them from appearing at his coronation. But some of them bringing him large presents from

their nation, presumed, notwithstanding these orders, to approach the hall in which the king dined. Being discovered, they were exposed to the insults and injuries of the bystanders; in consequence of which they fled, and were pursued by the people. A report was spread, that the king had given orders to massacre all the Jews. This supposed command was executed in the most cruel manner. Multitudes were slaughtered in the city of London, and this example was followed in most of the cities in England. Five hundred Jews had retired into York castle for safety: but finding themselves unable to defend the place, they murdered their wives and children; threw the dead bodies over the wall against their enemies who attempted to scale it; and then, setting fire to the houses, perished in the flames. The gentry in the neighbourhood, who were all indebted to the Jews, ran to the cathedral where their bonds were kept, and made a solemn bonfire of them before the altar.

Richard immediately began to take measures for his expedition into Palestine. His father had left him 100,000 marks; and this sum he augmented by all expedients he could think of, however pernicious to the public, or dangerous to the royal authority. He set up to sale the revenues and manors of the crown, and several offices of the greatest trust and power. Liberties, charters, castles, were given to the best bidders. His friends warned him of the danger attending this venality; but he told them he would sell the city of London itself, if he could find a purchaser. Numerous exactions were also practised upon all ranks and stations; menaces, promises, and expostulations, were used to fright the timid, and allure the avaricious. A zealous preacher of those times was emboldened to remonstrate against the king's conduct; and advised him to part with his three daughters, which were pride, avarice, and sensuality. To this Richard readily replied, "You counsel right, my friend: and I have already provided husbands for them all. I will dispose of my pride to the templars; my avarice to the monks; and as for my sensuality, the clergy shall share that among them." At length the king having got together a sufficient supply for his undertaking, and even sold his superiority over Scotland for a moderate sum, set out for the Holy Land; whither he was impelled by repeated messages from the king of France, who was ready to embark in the same enterprise.

An account of Richard's exploits in this expedition is given under the articles EGYPT, SICILY, CYPRUS, &c.—Having at last concluded a truce with Saladin, he set out on his return for England. He was, however, at a loss how to proceed. He durst not return by the way he came, as this would put him in the power of the king of France, between whom and the king of England an irreconcilable enmity had taken place. No way therefore was left, but by going more to the north; for which reason he took shipping for Italy, but was wrecked near Aquileia. From thence he travelled towards Ragusa, and resolved to make his way through Germany in the habit of a pilgrim. But his expences and liberalities having betrayed him notwithstanding this disguise, he was arrested by Leopold duke of Austria, who commanded him to be loaded with shackles. This prince had served under Richard

England.

129

Richard's preparations for his journey into Palestine.

130

Taken prisoner on his return.

at

England. at the siege of Acres (the ancient Ptolemais), where having received some disgust, he took this base method of revenging himself. Henry VI. emperor of Germany, was then equally an enemy to Richard on account of his having married Berengaria the daughter of Tancred king of Sicily. He therefore required the royal captive to be delivered up to him, and stipulated a large sum of money to the duke as a reward for his service.

The kingdom of England in the mean time was in great confusion. Richard had left it under the direction of Hugh bishop of Durham, and Longchamp bishop of Ely. The tempers of these prelates being very different, an animosity between them soon took place. Longchamp at last arrested his colleague, and obliged him to resign his power in order to obtain his liberty. The king, by many letters, commanded Longchamp to replace his coadjutor, but to no purpose. When the situation of the king became uncertain, Longchamp tyrannized to such a degree, that John the king's brother thought proper to oppose him. He then left the kingdom; and upon this the archbishop of Rouen was made justiciary in his room. The king of France being informed of these dissensions, strove to increase them as much as possible; and had even almost prevailed upon John to throw off his allegiance, by promising to put him in possession of all Richard's continental dominions.

131
Treachery
of John the
king's brother.

When the English first received the news of Richard's captivity, a general indignation was excited through the whole nation. The greatest, and almost the only traitor in the kingdom, was the king's own brother John. On the very first invitation from the court of France, he went abroad; and held a consultation with Philip, the object of which was the perpetual ruin and captivity of his unhappy brother. He promised to deliver into Philip's hands a great part of Normandy; and, in return, he received the investiture of all Richard's transmarine dominions: it is even said, that he did homage to the French king for the crown of England.

In consequence of this treaty, Philip invaded Normandy, and made considerable progress in the conquest of it. He was, however, at last repulsed by the Earl of Leicester, who was now returned from the Holy Land; and a truce was concluded on condition of paying the French king 20,000 merks, and putting four castles into his hands by way of security for the payment.—John, who had come over to England, met with still less success in his enterprises. He was only able to make himself master of the castles of Windsor and Wallingford; but when he came to London, and demanded the kingdom as heir to his brother, of whose death he pretended to have received certain intelligence, he was rejected by all the barons, and measures were taken to oppose and subdue him. The defence of the kingdom was so well provided for, that John, after some fruitless efforts, was obliged to conclude a truce with his opponents; and, before the expiration of it, he thought proper to retire to France, where he openly acknowledged his alliance with Philip.

All the efforts of Richard's enemies proved ineffectual to detain him in captivity. He was brought before the diet of the empire at Worms, where the emperor Henry brought against him a charge of many

crimes and misdemeanours: but to this the king replied with so much spirit and eloquence, that the German princes exclaimed loudly against the conduct of the emperor; the Pope threatened him with excommunication; and Henry, who had hearkened to the proposals of the king of France and prince John, found that it would be impossible for him to execute his and their base purposes, and detain the king of England any longer in captivity. He therefore concluded a treaty with him for his ransom; and agreed to restore him to his liberty for 150,000 merks, about L. 300,000 of our money, of which 100,000 merks were to be paid immediately, and 67 hostages delivered for the remainder.

The money for the king's ransom was most cheerfully raised by the English. The churches and monasteries melted down their plate to the amount of 30,000 merks; the bishops, abbots, and monks, paid a fourth part of their yearly rent; the parochial clergy contributed a tenth part of their tythes; and the requisite sum being thus collected, queen Eleanor and Walter archbishop of Rouen set out with it for Germany, paid the money to the emperor and duke of Austria at Mentz, delivered them hostages for the remainder, and freed Richard from his captivity. His escape was very critical. Henry had been detected in the assassination of the bishop of Liege, and in an attempt of the like nature on the duke of Louvaine; and finding himself extremely obnoxious to the German princes on account of these odious practices, he had determined to seek support from an alliance with the French king, and to detain Richard in perpetual captivity, notwithstanding the sum he had already received for his ransom. He therefore gave orders that Richard should be pursued and arrested; but the king making all imaginable haste, had already embarked at the mouth of the Scheldt, and was out of sight of land when the emperor's messengers reached Antwerp. The king of France no sooner heard of Richard's deliverance, than he wrote to John his confederate in these terms: "Take care of yourself: the devil is broke loose."

The king of England returned from captivity on the 20th of March 1194, and was received with the utmost joy by his subjects. He had been but one day landed, when his treacherous brother John came to make his submission. At the intercession of queen Eleanor he was received into favour. "I forgive him (said the king), and hope I shall as easily forget his offences as he will my pardon." Richard was impatient to revenge himself on the king of France, and therefore instantly made war upon him. But though both kings were inflamed with the most violent resentment against each other, they found it impossible to engage their powerful barons heartily in their cause. The war, therefore, produced no remarkable event; and, in 1195, was concluded by a truce for five years. On some slight occasion it was ready to break out anew, when the pope's legate interposed, and a treaty was about to be concluded. King Richard in the mean time was wounded by an arrow at the siege of Chalus, a castle of Limoges. The wound was not in itself dangerous; but being unskilfully treated, a mortification ensued, and the king expired on the 6th of April 1199, in the 10th year of his reign and 42d of his

England.

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Richard released from captivity.

133

Returns to England.

134

His death.

England. his age. By his will he left the kingdom to his brother John, but distributed a fourth part of his treasure among his servants.

¹³⁵ John succeeded to the crown. John succeeded to the crown of England without opposition, but soon found his affairs embarrassed on the continent. The king of France, who, during the life of king Richard, had always supported the pretensions of John, now gave a like support to the claims of prince Arthur the son of Geoffrey, who, though only 12 years of age, promised to be deserving of the kingdom. But in this matter the king of France showed so much regard to his own interest, that Constantia the mother of the young prince, thinking that her ally designed to keep for himself the provinces which he pretended to conquer for Arthur, submitted herself and her son to John, who detained them in Mans; and thus became undisputed master of the whole empire.

¹³⁶ His bad qualities.

The new king was weak, tyrannical, cruel, and treacherous. In short, he seemed to be endowed with almost every bad quality that can fall to the share of man. His conduct, therefore, soon rendered him universally odious. Imagining himself now secure on the side of France, he indulged his passion for Isabella the daughter and heiress of the count of Angouleme, with whom he was much enamoured. His queen, the heiress of the family of Gloucester, was still alive; and Isabella was married to the count de la Marche, tho', by reason of her youth, the marriage had not been consummated. John persuaded the count de Angouleme to carry off his daughter from her husband; at the same time that he procured, under some pretence or other, a divorce from the queen. Thus he incurred the displeasure of the pope, and also of the count de la Marche, and a powerful confederacy was formed against him.

As John had neither courage nor policy sufficient to keep his barons in awe, he took a method for that purpose equally base and cruel. This was by hiring a set of ruffians, whom he called his *champions*, to fight duels with them, in cases where they required to clear themselves from any charge by fighting a duel, according to the custom of those times. Thus he proposed to get rid of his refractory barons; but they, despising opponents who were so far below their rank, refused to fight with them, and a dangerous combination was formed among the barons against him.

¹³⁷ Murders his nephew.

The murder of prince Arthur rendered John still more generally detested. The young prince with his mother had fled to the court of France, where they were received with the greatest kindness, and found their interests more vigorously supported than before. Their enterprises were attended with considerable success, when Arthur himself had the misfortune to be taken prisoner. All the other captives were sent to England; but the prince was shut up in the castle of Falaise, and from that time was never heard of. It was universally believed that John had murdered him with his own hand; and this inflamed the general resentment against him to such a degree, that he soon after lost all his French provinces. In 1205, the duchy of Normandy itself was also conquered by Philip, and John was forced to fly with disgrace to England.

The king was resolved to wreak his vengeance upon the barons, who, he pretended, had deserted his stand-

ard in Normandy. For this reason, he levied large sums on their estates; in order, as he said, to undertake an expedition to the continent. This expedition, however, he several times capriciously deferred; and once having ventured out to sea, returned again without making the smallest attempt. At last, he landed at Rochelle, and burnt the city of Angiers; but hearing that the enemy were preparing to oppose him, he returned without attempting any thing else.

This irresolute and cowardly behaviour of John made him contemptible in the eyes of his subjects; but the Norman princes had so far extended the prerogatives of the English crown, that the barons, however discontented, durst not yet attempt to change the form of government. John, by entering into a controversy with the church, completed his ruin. The clergy, who for some time had acted as a community totally independent of the civil power, had their elections of each other generally confirmed by the pope, to whom alone they owed subjection. The election of archbishops, however, had been a subject of continual dispute between the suffragan bishops and the Augustine monks. In the mean time the archbishop of Canterbury died; and the Augustine monks, in a very private manner, elected Reginald, their superior, in his place. The bishops exclaimed against this election, as a manifest innovation of their privileges; and a furious theological contest was likely to ensue. John very imprudently took a side in this controversy, and espoused the cause of the suffragan bishops; in consequence of which, John de Grey bishop of Norwich was chosen. The cause was appealed to Rome; and Pope Innocent III. seizing with avidity an opportunity of extending his power, commanded the monks to choose cardinal Stephen Langton, an Englishman, then at the court of Rome. The being able to nominate an archbishop of Canterbury (a person of almost equal authority with the king), was an acquisition that would effectually give the court of Rome an unlimited authority over England. John therefore was resolved not to submit to this imposition; but he had not judgment sufficient to conduct him. He violently expelled the monks from their convent, and seized upon their revenues. The pope, perceiving from this absurd conduct, that John was unequal to the task he had undertaken, after some intreaties, threatened to put the whole kingdom under an interdict. The prelates threw themselves on their knees before the king, and in the most earnest manner intreated him to avoid the resentment of the holy tribunal, by receiving the primate, and restoring the monks to their convent. John, however, broke out into the most violent invectives. He swore by *God's teeth* (his usual oath), that if the kingdom was put under an interdict, he would banish the whole body of the clergy, and confiscate all their possessions. The pope at last, finding he might do it with safety, issued forth this terrible sentence so much dreaded by the whole nation. A stop was immediately put to divine service, and the administration of all the sacraments except baptism. The church-doors were shut, and the images of the saints laid on the ground. The dead were refused Christian burial; and were thrown into ditches and on the highways, without any funeral solemnity. Marriage was celebrated in the church-yards, and the people prohibited the use of meat as

¹³⁸ His contest with the pope.

¹³⁹ The kingdom laid under an interdict.

England. in times of public penance. They were debarred from all pleasure; even from shaving their beards, saluting each other, or paying any regard to their apparel. The clergy deplored the unhappy state of the nation in the most lamentable manner; while John, in revenge, imprisoned all their concubines, and treated the adherents of Langton with the utmost rigour.

¹⁴⁰ The king excommunicated, and the kingdom given to Philip of France. The furious and imprudent efforts of John proved totally ineffectual. He had scarce a friend left in the whole nation; and therefore, in 1209, the pope denounced a sentence of excommunication against him. This was soon followed by another still more terrible; namely, the absolving all the subjects of the king of England from their allegiance, and declaring every one to be excommunicated who had any commerce with him at his table, council, or even in private conversation. The king, rendered quite furious by these repeated indignities, wreaked his vengeance on his unhappy subjects, whose affections he ought rather to have attempted to conciliate. The pope, therefore, proceeded to execute the full measure of his wrath on this devoted prince, by giving away his kingdom to Philip of France. He published a crusade all over Europe against king John; exhorting the nobility, the knights and men of every condition, to take up arms against him, and enlist under the French banner. Philip was not less active on his part. He summoned all the vassals of the crown to attend him at Rouen; and having collected a fleet of 1700 vessels, was ready, in 1213, to invade England.

The pope had now overstretched his power; and had the English nation been governed by a prince of any degree of prudence or resolution, the power of the clergy would in all probability have been totally broken. The people, however superstitious and ready to obey in matters of religion, could not tamely submit to be given away by the pope as slaves from one master to another; and therefore this consideration, added to the natural antipathy subsisting between the French and English, put John, notwithstanding all his offences, at the head of an army of 60,000 men. But the pope was too great a politician to suffer matters to be carried to extremities. He promised himself many more advantages from the submission of John than from an alliance with Philip; and therefore came over in person, or, according to some, sent over his legate, to England, under pretence of conferring with the barons, but in reality to hold a conference with John. He there represented to this forlorn prince, the numbers of the enemy, the hatred of his own subjects, and the secret confederacy there was against him in England. He intimated, that there was but one way to secure him from the impending danger; namely, to put himself under the protection of the pope, who was a merciful father, and still willing to receive a repenting sinner. The abject and irresolute spirit of John submitted to this last piece of arrogance, and he took an oath to obey whatever the pope should command. In consequence of this oath, he took another, the most extraordinary mentioned in the records of history; and which, as it was taken while he commanded an army of 60,000 men, discovers a meanness of spirit almost incredible. The terms imposed by it were expressed in the following words. "I John, by the grace of God king of England and lord of Ireland, in order to

England. expiate my sins, from my own free will, and the advice of my barons, give to the church of Rome, to pope Innocent and his successors, the kingdom of England, and all other prerogatives of my crown. I will hereafter hold them as the pope's vassal. I will be faithful to God, to the church of Rome, to the pope my master, and his successors legitimately elected. I promise to pay him a tribute of 1000 merks; to wit, 700 for the kingdom of England, and 300 for the kingdom of Ireland."

This oath was taken by the king before all the people, kneeling, and with his hands held up between those of the legate. Having then agreed to reinstate Langton in the primacy, he received the crown which he had been supposed to have forfeited; while the legate, to add to his former insolence, trampled under his feet the tribute which John had consented to pay. — The king of France was enraged at this behaviour of the pope; and resolved to execute his project of conquering England, in spite of him and all his censures. His fleet, however, was attacked in their harbours by the English, who took 300 vessels, and destroyed about 100 more; while Philip, finding it impossible to prevent the rest from falling into the hands of the enemy, set fire to them himself, and thus was obliged to give up all hopes of success.

¹⁴² The barons attempt to reduce the prerogatives of the crown. John being thus freed from all danger, continued to follow the same cruel and tyrannical measures which had hitherto rendered him odious to his subjects. His scandalous subjection to the clergy, now gave the barons an opportunity of exerting themselves, in order to reduce the enormous prerogatives of the crown. Their designs were greatly facilitated by the concurrence of Langton the primate, who on all occasions showed a sincere regard for the interests of the kingdom. At a synod of his prelates and clergy, convened in St Paul's, on pretence of examining into the losses of some bishops who had been exiled by John, he privately conferred with a number of barons, to whom he expatiated upon the vices and injustice of their sovereign. He showed them a copy of Henry the first's charter; (being the only one in the kingdom, and which had been buried in the rubbish of an obscure monastery). Langton exhorted the barons to insist on a renewal of it; and this they solemnly swore to perform. The same agreement was afterwards renewed at a more numerous meeting of barons summoned by Langton at St Edmonsbury. Here it was resolved, that at Christmas they would prefer their common petition in a body; and in the mean time they separated with a design to put themselves in a posture of defence, enlist men, and fortify their castles. In the beginning of January 1215, they repaired to London, accoutred in their military garb and equipage, and presented their petition to the king, alleging that he had promised to grant a confirmation of the laws of Edward the Confessor, at the time he was absolved from his excommunication. John resented their presumption; and required a promise under their hands and seals, that they would never demand, or attempt to extort, such privileges for the future. This they refused with such unanimity and resolution, that the king desired time to consider of their demands. He promised, that, at the festival of Easter, he would give a positive answer to their petition; and offered them the archbishop of Canterbury, the bishop of Ely,

England. Ely, and the earl marshal, as sureties for fulfilling his engagements.

The barons accepted of his securities, and departed peaceably; but John had no design of complying with their desires. He had recourse to the clergy, whose power he had seen and felt in so many instances. He courted their favour, by granting them a charter establishing all those rights of which they were already in the possession, and which he now pretended to confirm when he had not the liberty to refuse. To ingratiate himself still farther with this body, he took the cross, and appealed to the pope against the usurpation of the barons. The pope wrote letters to England, reproaching the primate and bishops with favouring these dissensions; and commanded them to promote peace between the two parties. He exhorted the barons to conciliate the king, not with menaces, but with humble intreaties; and promised, upon their obedience, to interpose his own authority in favour of such of their petitions as he should find to be just. At the same time he annulled their association, and forbade them to enter into any confederacy for the future.

The barons paid no regard to the pope's remonstrances; knowing that the fulminations of the court of Rome would be of little avail, unless they were seconded by the clergy of England. After waiting till Easter, when the king promised to return them an answer, they met by agreement at Stamford. There they assembled a force of above 2000 knights, and a prodigious number of foot. Thence they marched to Brackley, about 15 miles from Oxford, the place where the court then resided. John, hearing of their approach, sent the archbishop of Canterbury, the earl of Pembroke, and others of his council, to know the particulars of their request, and what those liberties were which they so much importuned him to grant. The barons delivered a schedule containing the chief articles of their demands, founded on the charters of Henry and Edward; but which were in the highest degree displeasing to the king. He burst into a furious passion, asked the barons why they did not also demand his kingdom, and swore that he would never comply with such exorbitant demands. The confederates then chose Robert Fitzwalter for their general; whom they dignified with the title of "Marshal of the army of God and of the holy church." They laid siege to Northampton, took Bedford, and were joyfully received into London. They wrote letters to all the nobility and gentry who had not yet declared in their favour, threatening their estates with devastation in case of refusal or delay.

In the mean time the king was left at a place called *Odiham* in Surrey, attended only by seven knights. He vainly endeavoured to avert the storm by the mediation of his bishops and ministers. He appealed to Langton against the barons, not suspecting that he was engaged in the confederacy; and desired him to fulminate the church-censures against those who had made war upon their lawful prince. Langton declared that he would pass no censure where he found no delinquent; but said, that much might be done if the king would dismiss some foreign auxiliaries which he had lately brought over. Upon this John disbanded a great body of Germans and Flemings whom he had hitherto retained in his service, and Langton refused

to excommunicate a single baron. The king, being now quite defenceless, was obliged at last to comply with the demands of his subjects. A conference was accordingly appointed, and all things were adjusted for this most important treaty.

The king's commissioners met the barons at a place ¹⁴³ called *Runimede*, between Staines and Windsor; and ^{They force him to sign} which is yet held in reverence as the spot where the ^{Magna Charta.} standard of freedom was first erected in England. Here the king signed the charter called *Magna Charta*; which continues in force to this day, and is still regarded as the great bulwark of British liberty. See *MAGNA Charta*.

This charter, however, at the time that it was made, ¹⁴⁴ secured liberty to the clergy, barons, and gentlemen, ^{Principal articles of it.} much more than to the bulk of the people, who did not for a long time obtain any privileges of importance. Freedom of elections was secured to the clergy; and it was determined, that fines on them for any offence, should be laid on in proportion to their estates, and not the value of their benefices. The privileges secured to the barons were, either abatements in the rigour of the feudal laws, or relief from arbitrary and ambiguous decisions before the courts. It was also decreed, that barons should recover the lands of their vassals, even though forfeited by felony, after having been in the possession of the crown for a year and a day; and no tax was to be imposed without consent of the great council of the nation, excepting in case of the captivity of the king, the knighting of his eldest son, or marrying his eldest daughter. No land belonging to any baron was to be seized for a crown debt, unless the possessor had not personal property enough to pay it; neither was any vassal to be allowed to sell so much of his land as to incapacitate him from performing the necessary service to his lord. It was also determined, that when the great council of the nation was called, the prelates, earls, and barons, should be summoned by a particular writ, and the lesser barons should receive a summons from the sheriff. In favour of the people it was stipulated, that they should have from the barons all the immunities and privileges granted by the king to the former. Merchants were to be allowed to carry on their business without any arbitrary tolls or impositions, and to go out of the kingdom and return at pleasure. The goods of every freeman were to be disposed of according to his will; or if he died intestate, the nearest heir should succeed him. No carts, horses, or wood, were to be taken by the crown officers without the consent of the owner. The king's courts were to be stationary, and no delay to be made in doing justice to every one; no freeman should be taken or imprisoned, dispossessed of his free tenement, outlawed or banished, unless by the legal judgment of his peers, &c. It was likewise stipulated, that London should remain in the hands of the barons, and the tower be consigned to the primate, till the 15th of August following; or till the articles of the charter should be fulfilled. To give the more security for this, the king allowed them to choose 25 of their own number, to whose authority no limits were set either in extent or duration. If any complaint were made of a violation of the charter, either by the king or his officers, any four of the barons might admonish the king to redress the grievance; and if satisfaction were not obtained,

England. obtained, they might assemble the whole council of 25; and they, in conjunction with the great council, were empowered to compel him to fulfil the charter. In case of his resistance, they had liberty to levy war against him, attack his castles, and use every kind of violence, except against his person, or those of the queen or children. All men throughout the kingdom were bound, under the penalty of confiscation, to swear obedience to the 25 barons; and the freeholders of each county were to choose 12 knights, whose business it was to report such evil customs as ought to be redressed in terms of Magna Charta.

145 The king raises an army against his barons. But although John had thus obliged himself, by writing, to allow liberty to his subjects, he had no mind that they should enjoy it in reality. The sense of his subjection to his own vassals sunk deep in his mind. He became sullen, silent, and reserved. He shunned the society of his former friends; and retired into the Isle of Wight, as if to hide his disgrace in solitude; but, in reality, to meditate revenge against the barons. He sent to the continent to enlist a large body of mercenary troops, and made complaints to the pope of the insurrections of the barons against him. The pontiff very warmly espoused his cause; a bull was sent over, annulling the whole charter; and at the same time the foreign troops arriving, the king once more found himself in a condition to demand his own terms from his subjects.

146 They offer the kingdom to Louis the French king's son. The barons had made no preparations for war, not suspecting the introduction of a foreign army. The king, therefore, was for some time undisputed master of the field, and the most horrid cruelties were committed by his army. The nobility who had been most active in procuring the great charter fled with their families to Scotland, where they obtained the protection of king Alexander by doing homage to him. The barons being totally unable to raise an army capable of contending with that of John, applied to their old enemy Philip of France, offering to acknowledge his eldest son Louis for their sovereign, on condition of his protecting them from the fury of John and his mercenaries. The French king accepted their proposal with joy; and twenty-five hostages which he demanded being sent over, began to make the most diligent preparations for this expedition, regardless of the menaces of the pope, who threatened him with excommunication, and actually excommunicated his son Louis some time after.

The first troops who came to the assistance of the barons, were only a body of 7000 men; but, soon after, Louis with a powerful army landed at Sandwich. The first effect of this invasion was, that most of John's foreign troops deserted, refusing to serve against the heir of their monarchy. Many considerable noblemen also deserted his cause, and Louis daily gained ground. This prince advanced to London, where the barons and burghers did him homage, and took the oath of allegiance, after he had sworn to confirm the liberties and privileges of the people. His imprudence, however, in preferring on all occasions his French subjects to the English, soon excited a jealousy against him, which proved very prejudicial to his cause. This jealousy was greatly increased by the death-bed confession of the count de Melun, one of his courtiers, who declared to those about him, that it was Louis's design to exterminate the English barons as traitors,

and to bestow their dignities and estates upon his French subjects, on whose fidelity he could more safely rely. This caused a considerable desertion among Louis's party: so that John once more found himself in a condition to make an effort for his crown. He resolved to penetrate into the heart of the kingdom; and, for this purpose, he departed from Lynn, and took the road towards Lincolnshire at the head of a great body of troops. His road lay along the shore, which was overflowed at high water; but the king, not being apprised of this, or being ignorant of the tides of the place, lost all his carriages, treasure, and baggage by their influx. He himself escaped with the utmost difficulty, and arrived at the abbey of Swinestead; where his grief for the loss he had sustained, and the distracted state of his affairs, threw him into a fever, which soon appeared to be attended with fatal symptoms. He died at Newark in the year 1216, the 147 Death of 51st of his age, and 18th of his reign. He left king John. two legitimate sons: Henry, who succeeded him on the throne, and was about nine years of age; and Richard, who was about seven. He left also three daughters; Jane, married to Alexander king of Scotland; Eleanor, married to the Earl of Pembroke; and Isabella, married to the emperor Frederic II.

When John died, the Earl of Pembroke was marshal of England. By this office he was at the head of the army, and of consequence, in times of such turbulence, at the head of the state. He was a nobleman of great honour and fidelity, and had continued faithful to John in his greatest reverses of fortune. He now determined to support the authority of the infant prince Henry; and therefore carried him immediately to Gloucester, where the ceremony of coronation was performed, in the presence of Gualo the legate and a very few noblemen, by the bishops of Winchester and Bath. The young prince was obliged to swear fealty 148 Henry III. to the pope, and renew the homage which his father had done for the kingdom; after which the Earl of Pembroke was chosen protector.

Till the king arrived at the years of maturity, the transactions of his reign can only be considered as the consequences of the disposition of his tutors. Pembroke caused him grant a new charter of liberties, 149 He grants new charters. consisting of the concessions extorted from John, with some alterations; and the next year it was renewed, with the addition of some other articles. Thus these famous charters were brought very nearly to the shape in which they have ever since stood; and they were, during many generations, esteemed the most sacred rampart to national liberty and independence. As they secured the rights of all orders of men, they were anxiously defended by all, and became in a manner the basis of the English monarchy, and a kind of original contract, which both limited the authority of the king, and ensured the conditional allegiance of his subjects. Though often violated, they were still claimed and recalled by the nobility and people; and as no precedents were supposed valid that infringed them, they rather acquired, than lost, authority, from the frequent attempts made against them, in several ages, by regal and arbitrary power.

These charters were made use of by Pembroke as arguments to draw off the malecontent barons from their allegiance to Louis. He represented to them, that,

England. whatever jealousy they might have entertained against the late king, a young prince, the lineal heir of their ancient monarchs, had now succeeded to the throne, without succeeding either to the resentments or principles of his predecessor: That the desperate expedient, which they had employed, of calling in a foreign potentate, had, happily for them, as well as for the nation, failed of entire success; and it was still in their power, by a quick return to their duty, to restore the independence of the kingdom, and to secure that liberty for which they so zealously contended: That, as all past offences of the barons were now buried in oblivion, they ought, on their part, to forget their complaints against their late sovereign; who, if he had been anywise blameable in his conduct, had left to his son the salutary warning to avoid his paths, which had led to such fatal extremities: And that, having now obtained a charter for their liberties, it was their interest to show, by their conduct, that that acquisition was not incompatible with their allegiance; and that the rights of the king and people, so far from being hostile and opposite, might mutually support and sustain each other.

150
Decline of
prince
Louis's party.

These considerations, enforced by Pembroke's known character of constancy and fidelity, had a very great influence on the barons. Most of them began to negotiate with him, and many actually returned to their duty. At the same time Louis continued to disgust those of his own party by the preference which he visibly gave to the French. Though he went over to France, therefore, and brought fresh succours from thence, he found that his party was greatly weaker than before, by the desertion of his English confederates; and that the death of king John had, contrary to his expectations, occasioned the total ruin of his affairs. In a short time Pembroke was so much strengthened by deserters from Louis's party, that he ventured to invest Mount-Sorel; though upon the approach of the count de Perche with the French army, he desisted from that enterprise. The French general immediately marched to Lincoln; and, being admitted into the town, laid siege to the castle, and soon reduced it to extremity. Pembroke summoned his forces from every quarter, in order to relieve this important place; and he appeared so much superior to the French, that they shut themselves up within the city, resolving to take shelter there. But the garrison of the castle, having received a strong reinforcement, made a vigorous sally upon the besiegers, while the English army assaulted them from without. The French army was totally routed; the count de Perche with only two persons more were killed; but many of the chief commanders, and about 400 knights, were made prisoners. On the news of this fatal event, Louis raised the siege of Dover, and retired to London; where he received intelligence of a new disaster, which put an end to all his hopes. A French fleet, which carried a strong reinforcement, had appeared on the coast of Kent; where they were attacked and repulsed with considerable loss, by Philip D'Albiny. He is said to have gained the victory by the following stratagem. Having got the wind of the French, he came down upon them with violence; and throwing on their faces a great quantity of quicklime, which he purposely carried on board, they were so blinded that they were

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disabled from defending themselves. This misfortune so discouraged the barons who yet adhered to Louis, that they came from every quarter to make their submission to Pembroke; and Louis himself, finding his affairs totally desperate, was glad to make his escape from a country where every thing was become hostile to him. He therefore concluded a peace with the Protector; promised to evacuate the kingdom; and only stipulated, in return, an indemnity to his adherents, and a restitution of their honours and fortunes, together with the free and equal enjoyment of those liberties which had been granted to the rest of the nation.

151
He leaves
the king-
dom.

When the king grew up, he was found to be very unfit for the government of such a turbulent people as the English at that time were. Though his temper was mild and humane, he was also very weak, fickle, and irresolute. He disgusted the people by the caresses he bestowed on foreigners; and this disgust rose once to such a height, that the barons refused to assemble in the general council of the nation, or parliament, at his desire. When commanded to do so, they sent a message to Henry, desiring him to dismiss his foreigners; otherwise they would drive both him and them out of the kingdom, and put the crown on the head of one who was more worthy to wear it. The facility of Henry's temper also induced him to heap riches upon his foreign favourites in a manner which he could by no means afford: this often brought him into very great straits; and to relieve himself, he was obliged to have recourse to many arbitrary measures, which he could not otherwise have chosen. Nothing, however, of very great moment happened till the year 1255, when the Pope found means to embark Henry in a scheme for the conquest of Naples, or Sicily on this side the Fare, as it was called; an enterprise which not only brought much dishonour on the king, but involved him for some years in very great expence and trouble. The court of Rome some time before had reduced the kingdom of Sicily to the same state of feudal vassalage which she pretended to exercise over England; but Mainfroy, an usurper, under pretence of governing the kingdom for the lawful heir, had seized the crown, and was resolved to reject the Pope's authority. As the Pope found that his own force alone was not sufficient to gain his point, he had recourse to Richard the king of England's brother, who had been created Earl of Cornwall, and had such talents for amassing money, that he was reckoned the richest prince in Christendom. To him the Pope offered the kingdom of Sicily, upon the single condition of his conquering it from the usurper. Richard was too wise to accept this offer; upon which the Pope applied to Henry, and offered him the crown of Sicily for his second son Edmund. Henry, dazzled by this proposal, without reflecting on the consequences, or without consulting his brother or the parliament, gave the Pope unlimited credit to expend whatever sums he thought necessary for completing the conquest of Sicily. In consequence of this unlimited grant, his holiness determined to exert his apostolical authority to the utmost, in extorting money from the English. A cruel and intolerable extortion was published, requiring every one who had taken the cross against the infidels, or even vowed to advance money for that purpose, to support the war against Mainfroy, whom he accused as being a more terrible enemy

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The pope
undertakes
the con-
quest of
Sicily for
Henry's
son.

153
Intolerable
extortions
by his
holiness.

England.

enemy to the Christian faith than any Saracen. A tenth on all the ecclesiastical benefices in England was levied for three years; and orders were given to excommunicate the bishops who did not make punctual payment. A grant was made to the king of the goods of intestate clergymen, as well as of the revenues of vacant benefices and those of non-residents. These taxations, however grievous, were submitted to with little murmuring; but another suggested by the bishop of Hereford excited the most violent clamours. This prelate, who at that time resided at the court of Rome, drew bills on all the abbots and bishops of the kingdom, to the amount of no less than 150,540 marks, which he granted to Italian merchants in consideration of the money they had advanced or pretended to advance for the support of the Sicilian war. As it was apprehended that the English clergy would not easily submit to such an extraordinary demand, a commission was given to Rustand, the Pope's legate, to use his authority. An assembly of the prelates and abbots was accordingly summoned; who, on hearing the proposal sanctified with the names both of the Pope and King, were struck with the utmost surprise and indignation. A violent altercation took place; during which the legate told them, that all ecclesiastical benefices were the property of the Pope, and that he might dispose of them as he pleased. The affair ended, however, in the submission of the clergy: but the barons still continued refractory, and for some time answered the king's demands of supplies with expostulations; urging the king's partiality to foreigners, and the various injuries the nation had sustained from the servants of the crown. The great council of the nation, which had lately obtained the name of *parliament*, was therefore dissolved, and another called, but with as little success as before. The king, however, had involved himself in so much debt, that a large supply was become absolutely necessary; and as that could by no means be obtained from parliament, he was now reduced to the humiliating expedient of going about among such of his subjects as he thought most attached to him, and begging assistance from them at their own houses. At length his barons, perceiving the exigencies to which he was reduced, seemed willing to afford him aid; and, upon his promising to grant them a plenary redress of grievances, a very liberal supply was obtained, for which he renewed their charter with more than usual solemnity. All the prelates and abbots were assembled with burning tapers in their hands; the magna charta was read in their presence; and they denounced sentence of excommunication upon all who should infringe upon its decisions. They then put out their tapers on the ground, and exclaimed, "May every soul that proves false to this agreement so stink and corrupt in hell." The king subjoined, "So help me God, I will inviolably keep all these things, as I am a man, as I am a Christian, as I am a knight, and as I am a king crowned and anointed."

[153]
Henry solemnly renews Magna Charta.

154
He breaks his engagements, which occasions a revolution.

No sooner had the king received the supplies of which he stood so much in need, than he forgot all his engagements, put his confidence entirely in foreign counsellors, and evaded or broke through in numberless instances the charters he had given. This conduct rendered him so obnoxious to the barons, that Simon Mountfort Earl of Leicester, a man of a very violent

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and ambitious temper, determined to attempt an innovation in the government. He formed a powerful confederacy against the king, and the designs of the conspirators were effectually put in execution in the year 1258. Henry had summoned a parliament in expectation of receiving supplies for his Sicilian project; when the barons appeared in the hall, clad in complete armour, with their swords by their sides. The king, struck with this unusual appearance, asked them what was their purpose, and whether they pretended to make him their prisoner? Roger Bigod, Earl Marshal, answered in name of the rest, that he was not their prisoner; that they even intended to grant him large supplies, in order to fix his son on the throne of Sicily; that they only expected some return for this expence and service; and that as the king had frequently made submissions to the parliament, had acknowledged his past errors, and had still allowed himself to be carried into the same path, which gave them such reason of complaint, he must now yield to more strict regulations, and confer authority on those who were able and willing to redress the public grievances. Henry instantly assured them of his intentions to grant them all possible satisfaction; and for that purpose summoned another parliament at Oxford, to digest the new plan of government, and to elect proper persons who were to be entrusted with the chief authority. This assembly, afterwards called the *mad parliament*, went very expeditiously to work on the business of reformation. Twenty-four barons were appointed, with supreme authority, to reform the abuses of the state; and Leicester was placed at their head. Their first step was to order four knights to be chosen out of each county, who should examine into the state of their respective constituents, and should attend at the ensuing parliament to give information of their complaints. They ordained that three sessions of parliament should be regularly held every year; that a new high sheriff should be elected annually; that no wards nor castles should be entrusted to foreigners, no new forests made, nor the revenues of any counties let to farm.

These constitutions were so just, that some of them remain to this day. But the parliament having once obtained the sovereign power, took care not to part with it again. They not only protracted the time of their sitting under various pretences; but at last had the effrontery to impose an oath upon every individual of the nation, declaring an implicit obedience to all the statutes executed or to be yet executed by the barons who were thus appointed as rulers. They not only abridged the authority of the king, but the efficacy of parliament also; giving up to 12 persons the whole parliamentary power between each session. Their usurpations were first opposed by the knights of the shire, whom they themselves had appointed. These had for some time begun to be regularly assembled in a separate house, to consider of the national grievances; the first of which was the conduct of the 24 rulers. They represented, that though the king had performed all that was required of him, the barons had hitherto done nothing on their part that showed an equal regard for the people; that their own interest and power seemed the only aim of all their decrees; and they even called upon the king's eldest son prince

England.

155
Bad conduct of the new rulers.

4 K

Edward

England.

156
Opposed by
prince Ed-
ward.

Edward to interpose his authority, and save the sinking nation.

The prince was at this time about 22 years of age, and by his active and resolute conduct had inspired the nation with great hopes. He told those who made the application to him, that he had sworn to the late constitutions; and, on that account, though they were contrary to his own private opinions, he was resolved not to infringe them. At the same time, however, he sent a message to the barons, requiring them to bring their undertaking to an end, or otherwise to expect the most vigorous resistance to their usurpations. On this the barons were obliged to publish a new code of laws, which, though it contained scarce any thing material, yet, it was supposed, would for a while dazzle the eyes of the people, until they could take measures to establish their authority upon surer foundations. In this manner, under various pretences, they continued their power for three years; while the whole nation loudly condemned their treachery, and the Pope himself at last absolved the king and his subjects from the oath they had taken to obey their injunctions. Soon after this, a parliament was called, and the king reinstated in his former authority. The barons were obliged to submit for a time; but the Earl of Leicester having joined the Welsh, who at this time made an irruption into England, the kingdom was reduced to the most deplorable situation. The pusillanimity of the king prevented any proper or judicious method from being pursued for extricating the people from their distresses; and at last a treaty was concluded with the barons on the most disadvantageous terms that can be imagined. They were restored to the sovereignty of the kingdom, took possession of all the royal castles and fortresses, and even named the officers of the king's household. They summoned a parliament to meet at Oxford, in order more fully to settle the plan of government; and by this assembly it was enacted, that the authority of the 24 barons should continue not only during the life of king Henry, but also during that of prince Edward.

157
Who is de-
feated and
taken pri-
soner, with
the king
and his bro-
ther.

These scandalous conditions would have been easily complied with by king Henry; but they were utterly rejected by prince Edward, and a civil war immediately ensued. The prince was at first successful; but, through his impetuosity, occasioned the loss of a great battle, in which his father and uncle were taken prisoners, and he himself was obliged soon after to surrender to the earl of Leicester. The king was now reduced to the most deplorable situation. His partisans were totally disarmed, while those of the earl of Leicester still kept themselves in an offensive posture. Leicester seized the estates of no fewer than 18 barons; engrossed to himself the ransom of all the prisoners; monopolized the sale of wool to foreign markets; and at last ordained that all power should be exercised by nine persons, who were to be chosen by three others, or the majority of them; and these three were the earl of Leicester himself, the Earl of Gloucester, and the bishop of Chichester.

148
First House
of Com-
mons.

The miserable situation to which the kingdom was now reduced, proved at last the means of settling the government on a more proper foundation. Leicester, in order to secure himself, was obliged to have recourse to an aid, till now, entirely unknown in England, namely, that of the body of the people. He called a

parliament, where, besides the barons of his own party, and several ecclesiastics who were not proper tenants of the crown, he ordered returns to be made of two knights from every shire; and also deputies from the boroughs, which had been hitherto considered as too inconsiderable to be allowed any share in the legislation. This parliament was called on the 20th of January 1265: and here we find the first outline of an English House of Commons; an institution which has ever since been considered as the bulwark of British liberty.

The new parliament was far from being so compliant to Leicester as he had desired or expected. Many of the barons who had hitherto steadfastly adhered to his party, were disgusted with his boundless ambition; and the people, who found that a change of masters was not a change from misery to happiness, began to wish for the re-establishment of royal authority. Leicester at last, to make a merit of what he could not prevent, released prince Edward from his confinement, and had him introduced at Westminster-hall, where his freedom was confirmed by the unanimous voice of the barons. But though Leicester had all the popularity of restoring the prince, he was yet politic enough to keep him guarded by his emissaries, who watched all his actions. At last, however, he found means to make his escape in the following manner. The Duke of Gloucester, being disgusted with Leicester, retired from court, and went to his estates on the borders of Wales. His antagonist pursued him thither; and to give the greater authority to his arms, carried the king and prince of Wales along with him. This furnished young Edward with the opportunity he had so long desired. Being furnished by the Earl of Gloucester with an horse of extraordinary swiftness, he took leave of his attendants, who were in fact his guards, but were not able to come up with him. They pursued him, however, for some time; but the appearance of a body of troops belonging to Gloucester soon put an end to their pursuit.

The prince no sooner recovered his liberty, than the royalists joined him from all quarters, and an army was soon procured which Leicester could not withstand. This nobleman now found himself in a remote quarter of the kingdom; surrounded by his enemies; and debarred from all communication with his friends by the river Severn, whose bridges Edward had broken down. In this extremity, he wrote to his son to hasten to his assistance from London, with a considerable army which he had under his command. With this view his son advanced to Kenilworth; but here he was surprised, and his army entirely dispersed by prince Edward. The young prince, immediately after this victory, advanced against Leicester himself; who, ignorant of the fate of his son's army, had passed the Severn in boats. He was by no means able to cope with the royalists; his men being inferior both in numbers and resolution to their antagonists. His army was defeated with great slaughter. Leicester himself was slain, though he called out for quarter, together with his eldest son Henry, and about 160 knights and other gentlemen. The old king had been purposely placed by the rebels in the front of the battle, where he was wounded, and in great danger of being killed; but, crying out, "I am Henry of Winchester your king," he was saved and put in a place of security by his son, who

England.

159
Prince Ed-
ward re-
covered his li-
berty.

160

Earl of Lei-
cester de-
feated and
killed.

England. who had flown to his assistance. The body of Leicester being found among the dead, was barbarously mangled by one Roger Mortimer; and then sent to his widow, as a testimony of the royal party's barbarity and success.

This victory, gained at Evesham, proved decisive in favour of the royal party. Almost all the castles, garrisoned by the barons, hastened to make their submissions, and opened their gates to the king. The Isle of Axholme alone, and that of Ely, trusting to the strength of their situation, ventured to make resistance; but were at last reduced, as well as the castle of Dover, by the valour and activity of prince Edward. Adam de Gourdon, a courageous baron, maintained himself some time in the forests of Hampshire, committing depredations in the neighbourhood; and obliged the prince to lead a body of troops into that country against him. Edward attacked the camp of the rebels; and being transported by the ardour of action, leaped over the trench with a few followers, and encountered Gourdon himself in single combat. The victory was long disputed between these two valiant combatants; but ended at last in the prince's favour, who wounded his antagonist, threw him from his horse, and took him prisoner. He not only granted him his life; but introduced him that very night to the queen at Guildford, procured his pardon, and was ever after faithfully served by him.

161
Death of
Henry III.

In 1271, prince Edward, having settled the affairs of the kingdom, undertook an expedition to the Holy Land, where he signalized himself by many acts of valour. The king's health declined visibly after the departure of his son; and at last, worn out with cares and the infirmities of age, he expired at St Edmonsbury on the 16th of November 1272, in the 64th year of his age and the 56th of his reign.

162
Edward I.

Prince Edward had reached Sicily in his return from the Holy Land, when he received an account of his father's death; at which he expressed much concern. As he knew that England was at that time in a state of perfect tranquillity, he was in no haste to return, but spent near a year in France before he made his appearance in England. He was received by his subjects with the utmost joy, and crowned at Westminster by Robert archbishop of Canterbury on the 19th of August 1274. He immediately applied himself to the correcting of those disorders which the civil commotions, and weak administration of his father, had introduced. A system of strict justice, bordering on severity, was introduced and kept up thro' the whole of this reign. The Jews were the only part of his subjects whom Edward oppressed. Many arbitrary taxes were levied upon them; 280 of them were hanged at once for adulterating the coin; the goods of the rest were confiscated, and all of them banished the kingdom.

163
Conquers
Wales.

In 1276, the king undertook an expedition against Lewellyn prince of Wales, who had refused to do homage for his crown. The conquest of that country was not fully accomplished till the year 1283; after which the principality of Wales was annexed to the crown of England, and thenceforth gave a title to the king's eldest son. — In 1286, the settlement of Wales appeared so complete, that the king went abroad in order to make peace between Alfonso king of Arra-

* See Wales.

gon and Philip le Bel king of France, who had a difference about the kingdom of Sicily. He succeeded in his negotiations; but, staying abroad three years, he found that many disorders had been introduced in his absence. Many instances of robbery and violence had broke out in all parts of England; but the corruption of the judges, by which the fountains of justice were poisoned, was of still more dangerous consequence. Edward, in order to remedy this prevailing abuse, summoned a parliament, and brought the judges to a trial; where all of them except two, who were clergymen, were convicted of this flagrant iniquity, were fined, and deposed from their office. The amount of the fines levied upon them is of itself a sufficient proof of their guilt, being above 100,000 marks; an immense sum in those days, sufficient to defray the expences of a war betwixt two great nations. The king afterwards made all the new judges swear that they would take no bribes; but the deposing and fining the old ones was the more effectual remedy.

In 1291, king Edward began to meditate the conquest of Scotland, which employed him during the rest of his life; but which, though that kingdom was by him reduced to the greatest distress, he was never able to accomplish *. At the same time, he was engaged in expensive contests with France; and these multiplied wars and preparations for war, by obliging him to have frequent recourse to parliamentary supplies, became the remote causes of great and important changes in the government. The parliament was modelled into the form which has continued ever since. As a great part of the property of the kingdom, by the introduction of commerce and improvements in agriculture, was transferred from the barons to the lower class of people, so their consent was thought necessary for raising the supplies. For this reason, the king issued writs to the sheriffs, enjoining them to send to parliament, along with two knights of the shire, two deputies from each borough within their county; and these provided with sufficient powers from their constituents to grant such demands as they should think reasonable for the safety of the state. The charges of these deputies were to be borne by the boroughs which sent them; and so far were they from considering this deputation as an honour, that nothing could be more displeasing to any borough than to be thus obliged to send a deputy, or to any individual than to be thus chosen. The authority of these commoners, however, increased through time. Their union gave them weight; and it became customary among them, in return for the supplies which they granted, to prefer petitions to the crown for the redress of those grievances under which the nation was supposed to labour. The more the king's necessities increased, the more he found it necessary to give them an early redress; till, from requesting, the commons proceeded to requiring; and having all the property of the nation, they by degrees began also to be possessed of the power.

Edward I. died of a dysentery at Carlisle on the 7th of July 1307, as he was leading a great army into Scotland, against the inhabitants of which he had vowed the most dreadful vengeance. He was succeeded by his son Edward II. whom he had charged with his dying breath to prosecute the war against Scotland, and never to desist till he had finally subdued the king.

164
Attempts
the con-
quest of
Scotland.

* See Scot-
land.

165
New mo-
dels the
parlia-
ment.

166
Dies, and is
succeeded
by Edw. II.

England. kingdom. But the new king was of a very different disposition from his father. The Scots gradually recovered their power; and in 1314 gave the English such a terrible defeat at Bannockburn, that for many years no superiority of numbers could encourage them to look the Scots in the face. See SCOTLAND.

167
Discontents
of his sub-
jects.

The reign of Edward II. affords no particulars of great moment. Being a prince of a weak understanding, though endued with no remarkable bad qualities, his reign was one continued series of quarrels with his turbulent subjects. His favourites were the most general causes of discontent. The first of these was one Piers Gaveston, the son of a Gascon knight of some distinction, who had honourably served the late king, and who, in reward for his services, had obtained an establishment for his son in the family of the prince of Wales.—To be the favourite of any king whatever, is no doubt in itself a sufficient offence to the rest of the courtiers. Numberless faults were therefore found with Gaveston by the English barons. When the king went over to France to espouse the princess Isabella, to whom he had been long contracted, Gaveston was left guardian of the realm, with more ample powers than had usually been conferred in such a case. But when the queen, who was of an imperious and intriguing spirit, arrived, Gaveston had the misfortune to fall under her displeasure also, on account of the ascendancy he had acquired over the king. A conspiracy was therefore soon formed against the favourite; at the head of which were, the queen, and the Earl of Lancaster cousin-german to the king, and the most opulent and powerful nobleman in England. The king, unable to resist such a combination, was at last obliged to banish Gaveston; but recalled him some time after. This was sufficient to spread an alarm over the whole kingdom: a civil war ensued; and the nobility having got Gaveston into their hands, soon freed themselves of any farther apprehensions from him, by putting him to death.

After the unfortunate defeat at Bannockburn, king Edward chose a new favourite named *Hugh Le Despenser*. He was a young man of a noble English family; some merit, and very engaging accomplishments. His father was a person of a much more respectable character than the son; but the being admitted to a share of king Edward's favour was a sufficient crime. The king imprudently dispossessed some lords of their estates, in order to bestow them upon this favourite; and this was a sufficient pretence for openly attacking both the father and son. The Earls of Lancaster and Hereford flew to arms. Sentence was procured from parliament of perpetual exile against the two Spensers, with a forfeiture of all their estates. At last the king took the field at the head of 30,000 men, and pressed the Earl of Lancaster so closely, that he had not time to collect his forces together; and, flying from one place to another, he was at last stopped in his way towards Scotland, and made prisoner. He was immediately condemned by a court-martial; and executed on an eminence near Pomfret, with circumstances of the greatest indignity.

Spenser now triumphed for some time over his enemies; most of the forfeitures were seized for his use,

and he is said to have been guilty of many acts of rapine and injustice. But he was soon opposed by a more formidable enemy. Queen Isabella fled to France, and refused to return to England till Spenser was removed from the royal presence, and banished the kingdom. Thus she made herself popular in England, where Spenser was universally disliked; and she had the pleasure of enjoying the company of a young nobleman named *Mortimer*, upon whom she had lately placed her affections. The queen's court, therefore, became a sanctuary for all the malecontents who were banished their own country, or who chose to come over. When she thought matters were ripe for her purpose, she set sail from Dort harbour, accompanied by 3000 armed men. She landed without opposition on the coast of Suffolk, on the 24th of September 1326; and she no sooner appeared, than there seemed to be a general revolt in her favour. The unfortunate king found the spirit of disloyalty spread over the whole kingdom. He had placed some dependence on the garrison of Bristol, which was under the command of the elder Spenser: but they mutinied against their governor; and that unfortunate favourite was delivered up, and condemned by the tumultuous barons to the most ignominious death. He was hanged on a gibbet in his armour; his body was cut in pieces and thrown to the dogs; and his head was sent to Winchester, where it was set on a pole, and exposed to the insults of the populace. Young Spenser did not long survive his father. He was taken, with some others who had followed the fortunes of the wretched king, in an obscure convent in Wales. The queen had not patience to wait the formality of a trial; but ordered him to be immediately led forth before the insulting populace, and seemed to take a savage pleasure in beholding his distress. He was executed on a gibbet 50 feet high; his head was sent to London, where it was received by the citizens with brutal triumph, and fixed on the bridge.

In the mean time the king, who hoped to find refuge in Wales, was quickly discovered, and delivered up to his adversaries, who insulted him in the grossest manner. He was conducted to the capital amidst the insults and reproaches of the people, and confined in the tower. A charge was soon exhibited against him; in which no other crimes but his incapacity to govern, his indolence, his love of pleasure, and his being swayed by evil counsellors, were objected against him. His deposition, however, was quickly voted by parliament; he was assigned a pension for his support; his son Edward, a youth of 14, was chosen to succeed him, and the queen was appointed regent during the minority. The deposed monarch did not long survive the loss of his crown. He was at first consigned to the custody of the Earl of Lancaster; but this nobleman showing some marks of respect and pity, he was taken out of his hands, and delivered over to the lords Berkeley, Mautravers, and Gournay, who were entrusted alternately, each for a month, with the charge of guarding him. While he was in Berkeley's custody, he was still used with some degree of humanity; but when the turn of Mautravers and Gournay came, every species of indignity was practised upon him, as if they had designed to accelerate his death by the bitterness of his sufferings. It is reported, that one day when

England.
168
Insurrection
against
him by the
queen.

169
Edward de-
posed;

Ed.

England. Edward was to be shaved, they ordered cold and dirty water to be brought from a ditch for that purpose; and when he desired it to be changed, and was still denied his request, he burst into tears and exclaimed, That in spite of their insolence he would be shaved with clean and warm water. As his persecutors, however, saw that his death might not arrive, even under every cruelty they could practise, and were daily afraid of a revolution in his favour, they determined to rid themselves of their fears by destroying him at once. Mortimer, therefore, secretly gave orders to the two keepers, who were at his devotion, instantly to dispatch the king; and these ruffians contrived to make the manner of his death as cruel and barbarous as possible. Taking advantage of Berkeley's sickness, in whose custody he then was, and who was thereby incapacitated from attending his charge, they came to Berkeley-castle, and put themselves in possession of the king's person. They threw him on a bed, and held him down with a table which they had placed over him. They then ran a horn pipe up his body, through which they conveyed a red-hot iron; and thus burnt his bowels without disfiguring his body. By this infernal contrivance they expected to have their crime concealed: but the horrid shrieks of the king, which were heard at a distance from the castle, gave a suspicion of the murder; and the whole was soon after divulged by the confession of one of the accomplices. Gournay and Mautravers were held in detestation by all mankind; and when the ensuing revolution deprived their protectors of power, they found it necessary to fly the kingdom. Gournay was afterwards seized at Marseilles, delivered over to the seneschal of Guienne, and put on board a ship with a view of carrying him over to England; but he was beheaded at sea, by secret orders, as was supposed, of some nobles and prelates in England, anxious to prevent any discovery which he might make of his accomplices. Mautravers concealed himself for some years in Germany; but having found means of rendering some services to Edward III. he ventured to approach his person, threw himself on his knees before him, and received a pardon.

170
And cruelly murdered.

171
Sovereign power assumed by the queen and Mortimer.

By the death of Edward II. the government fell entirely into the hands of the queen and her paramour Mortimer. The parliament, which raised young Edward to the throne, had indeed appointed 12 persons as his privy-council, to direct the operations of government. Mortimer excluded himself, under a show of moderation; but at the same time secretly influenced all the measures that came under their deliberation. As this influence began very soon to be perceived, and the queen's criminal attachment to Mortimer was universally known, these governors soon became very obnoxious to the people. The first stroke given to Mortimer's power was during an irruption of the Scots, when the favourite prevented the young king from attacking the enemy. Though it is very probable that the English army would have been destroyed by making an attack on an army situated in such an advantageous post as the Scots at that time occupied, Mortimer incurred great blame on that account. He was accused of having allowed the Scots to make their escape; and the general disgust on this account was increased by his concluding a peace with that kingdom,

wherein the English renounced all title to the sovereignty of Scotland for the sum of 30,000 marks. Soon after Mortimer seized and executed the earl of Kent, brother to the late king; who, supposing Edward II. to be still alive, had formed a design of reinstating him in his kingdom. The execution was so sudden, that the young king had not time even to interpose in his behalf; and Mortimer soon after seized this nobleman's estate for his own use, as he did also the immense fortunes of the Spencers.

Edward, finding the power of Mortimer a continual restraint upon himself, resolved to shake off an authority that was likewise grown odious to the whole nation. The queen and Mortimer had for some time chosen the castle of Nottingham for their residence. It was strictly guarded, the gates were locked every night, and the keys carried to the queen. It was therefore agreed between the king and some of the barons, who secretly entered into his designs, to seize upon them in this fortress. Sir William Eland the governor was induced to admit them through a subterraneous passage, which had been formerly contrived for an outlet, but was now choked up with rubbish, and known only to one or two. Through this passage the noblemen in the king's interest entered the castle in the night-time; and Mortimer, without having it in his power to make any resistance, was seized in an apartment adjoining to that of the queen. The parliament, which was then sitting, condemned him, without either permitting him to make his defence, or examining a single witness against him. He was hanged on a gibbet at a place called *Elmes*, about a mile from London. A similar sentence was passed against some of his adherents, particularly Gournay and Mautravers, who found an opportunity of escaping as above mentioned. The queen, who was perhaps the most culpable of the whole, was screened by the dignity of her station. She was, however, deposed from all share of power; and confined for life to the castle of Rising, with a pension of 3000 pounds a-year. From this confinement she was never set free, though the king paid her an annual visit of ceremony. She lived 25 years after her deposition.

Edward III. proved the greatest warrior that ever sat on the English throne. He first attempted to raise Edward Baliol to the sovereignty of Scotland; but this he found impossible fully to accomplish. Edward next formed a project of invading and conquering France, to the sovereignty of which he pretended a right. His first expectations were attended with so little success, that on his return to England he found the nation very much discontented, and himself harassed by his numerous creditors without any sufficient resource for paying them. Being determined, however, not to bear any blame himself if he could throw it any where else, he took the first opportunity of wreaking his vengeance upon his subjects. Finding therefore the tower of London negligently guarded on his arrival, he imprisoned the constable and all his inferior officers, treating them with the greatest severity. He then fell upon the sheriffs and collectors of the revenue, whom he dismissed from their employments, and appointed an inquiry into their conduct to be made by persons who, knowing the king's humour, were sure to find every one guilty who came before them. The keeper of the privy-seal, the chief-justice, the mayor of London, the

England.

172
Mortimer executed.

173
Edward invades France successfully.

174
His arbitrary behaviour on his return.

England.
175
Is opposed
by the
archbishop
of Canter-
bury;

the bishops of Chichester and Litchfield, with the chancellor and treasurer, were deposed and imprisoned. In this career of resentment and cruelty, however, he found himself opposed by the archbishop of Canterbury, whom he had appointed to collect the taxes laid on for the support of the French war. That prelate happening to be absent at the time of the king's arrival, did not immediately feel the effects of his resentment. Being informed, however, of the humour in which his sovereign was, he issued a sentence of excommunication against all who, on any pretence whatever, should exercise violence against the persons or estates of clergymen, or who infringed those privileges secured by the great charter, or who accused a prelate of treason, or any other crime, in order to bring him under the king's displeasure. A regular combination was formed against the king by the clergy, with the primate at their head; who, to execute the indignation of the people as much as possible, reported, that the king intended to recall the general pardon and the remission to old debts which had been granted, and to impose new and arbitrary taxes without consent of parliament. The archbishop also, in a letter to the king, informed him, that there were two powers by which the world was governed, viz. the holy pontifical apostolical dignity and the regal authority; of which the clerical power was evidently the supreme, as the priests were to answer even for the conduct of kings at the last judgment; and were besides the spiritual fathers of all the faithful, kings and princes not excepted; having, besides, a heavenly charter, intitling them to direct their wills and actions, and to censure their transgressions. On this the king resolved to mortify him, by sending no summons to him when the parliament was called: but the prelate, undaunted by this mark of resentment, appeared before the gates of the parliament-house with his crozier in his hand, demanding admittance as the first peer of the realm. This application was rejected for two days, but at last complied with; and the parliament now seemed inclined to abridge the king's authority considerably. They began with observing, that as the great charter had been violated in many points, particularly by the illegal imprisonment of many freemen and the seizure of their goods, it was necessary to confirm it anew, and to oblige all the chief officers of the law and others to swear to the observance of it. It was also required, that whenever any of the great offices became vacant, the king should fill them up by the advice of his council and the consent of such barons as should at the time be found to reside in the neighbourhood of the court. They enacted also, that on the third day of every session the king should resume all such offices into his own hand, excepting those of the justices of the two benches and the barons of exchequer; that the ministers should for the time be reduced to private persons; that they should in that condition answer before parliament to any accusation preferred against them; and that, if they were found in any respect guilty, they should be finally deprived of their offices, and others appointed in their stead. In return for such ample concessions, the king was offered a grant of 20,000 sacks of wool; and such was his urgent necessity, that he was compelled to accept of it even upon these terms. Still, however,

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And obli-
ge at last
to submit.

he determined to adhere to his engagements no longer than till this necessity was removed. Though the agreement therefore was ratified in full parliament, he secretly entered a protest, that, as soon as his convenience permitted, he would from his own authority revoke what had been extorted from him. This protest was afterwards confirmed by a public edict; in which he asserted, that that statute had been made contrary to law; that it was prejudicial to the prerogatives of the crown, which he had only dissembled when he seemed to ratify it; and that in his own breast he had never assented to it: and declared, that from thenceforth it had no force or authority. This exertion of arbitrary power, which it might have been imagined would have occasioned a prodigious clamour, was not taken notice of by any of the subsequent parliaments; so that in the course of two years Edward had entirely regained his authority, and obtained a repeal of the obnoxious statute just mentioned. Having thus settled matters to his satisfaction, the king resumed his expedition against France, where he gained great advantages. In his absence the Scots invaded England; but were entirely defeated at Durham, and their king himself taken prisoner. The English king in the mean time continued his victories on the continent; in which he was greatly assisted by Edward surnamed the *Black Prince*, the greatest hero recorded in the English annals. But for the wars of Edward III. and the exploits of this famous prince, see the articles SCOTLAND and FRANCE. The *Black Prince* died on the 8th of June 1376, and the king survived only about a year. He expired on the 21st of June 1377, and was succeeded by his second son Richard.

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But regains
his power.

178
Performs
great ex-
ploits in
France.

179
Richard II.

As the new king was only eleven years old when he ascended the throne, the government was vested in the hands of his three uncles the dukes of Lancaster, York, and Gloucester. The different dispositions of these noblemen, it was thought, would cause them check the designs of each other. Lancaster was neither popular nor enterprising; York was indolent and weak; and Gloucester turbulent, popular, and ambitious. Discontents first arose among the common people. They had now acquired a share of liberty sufficient to inspire them with a desire for more, and this desire was greatly increased by the discourses of one John Ball a seditious preacher. He went about the country, and inculcated on his audience, that mankind were all derived from one common stock; and that all of them had equal right to liberty and the goods of nature, of which they had been deprived by the ambition of a few insolent rulers.

These doctrines were greedily swallowed by the populace, who were farther inflamed by a new imposition of three groats a-head upon every person in the kingdom above 15 years of age. This had been granted as a supply by parliament, and was no doubt necessary on account of the many expensive wars in which the kingdom was engaged; but its apparent injustice, in laying no more burden upon the rich than the poor, excited the utmost resentment of the people. The manner, too, of collecting this tax, soon furnished them with an occasion of revolt. It began in Essex, where a report was industriously spread that the peasants were to be destroyed, their houses burned, and their farms plundered. A blacksmith, well known by the name

of

England.

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Dangerous
insurrec-
tion by
Wat Ty-
ler.

of *Wat Tyler*, was the first that excited them to arms. The tax-gatherers coming to this man's house while he was at work, demanded payment for his daughter. This he refused, alleging that she was under the age mentioned in the act. One of these fellows offered to produce a very indecent proof to the contrary, and at the same time laid hold of the maid. This the father resenting, immediately knocked out the ruffian's brains with his hammer. The bystanders applauded the action; and exclaimed that it was high time for the people to take vengeance on their tyrants, and to vindicate their native liberty. The whole country immediately took arms, and the insurgents soon amounted to about 100,000 men. They advanced to Blackheath, where they sent a message to the king, who had taken shelter in the tower, desiring a conference with him. The king was desirous of complying with their demands, but was intimidated by their fierce behaviour. In the mean time they entered the city, burning and plundering the houses of such as were obnoxious for their power or riches. Their animosity was particularly levelled against the lawyers, to whom they showed no mercy. The king at last, knowing that the tower was not able to resist their assaults, went out among them, and desired to know their demands. To this they made a very humble remonstrance; requiring a general pardon, the abolition of slavery, freedom of commerce in the market-towns, and a fixed rent instead of those services required by the tenure of villenage. The king granted all these requests; and charters were made out by which the grant was ratified. In the mean time, however, another body of these insurgents had broke into the tower, and murdered the chancellor, the primate, and the treasurer, with some other officers of distinction. They then divided themselves into bodies, and took up their quarters in different parts of the city. At the head of one of these was *Wat Tyler*, who led his men into Smithfield, where he was met by the king, who invited him to a conference under pretence of hearing and redressing his grievances. Tyler ordered his companions to retire till he should give them a signal, and boldly ventured to begin a conference with the king in the midst of his retinue. His demands were, That all slaves should be set free; that all commonages should be open to the poor as well as to the rich; and that a general pardon should be passed for the late outrages. Whilst he made these demands, he now and then lifted up his sword in a menacing manner: which insolence so raised the indignation of *William Walworth* lord mayor of London, that, without considering the danger to which he exposed his majesty, he stunned Tyler with a blow of his mace; while one of the king's knights riding up, dispatched him with his sword. The mutineers, seeing their leader fall, prepared themselves to take revenge. Their bows were already bent for execution; when *Richard*, though not yet 16 years of age, rode up to the rebels, and with admirable presence of mind cried out: "What, my people, will you kill your king? Be not concerned for the loss of your leader. I myself will now be your general. Follow me into the field, and you shall have whatever you desire." The multitude immediately desisted, and followed the king into the fields, where he granted them the same charters that he had before granted to their compa-

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He is kill-
ed.

nions. These charters, however, were soon after revoked, and the common people reduced to the same situation in which they had formerly been.

The courage, address, and presence of mind, which the king had discovered in quelling such a dangerous tumult, gave great hopes to the nation: but, in proportion as *Richard* advanced in years, these hopes were blasted; and his want of capacity, or at least of solid judgment, appeared in every enterprise he attempted. The king had unluckily lost the favour of the common people after the insurrection just mentioned. He allowed the parliament to revoke the charters of enfranchisement and pardon which had been granted; some of the ringleaders in the late disorders had been severely punished, and some even put to death without any form of process or trial. Thus the popular leaders were greatly exasperated by this cruelty, though probably the king did not follow the dictates of his own mind so much in it as the advice of his counsellors. But having thus lost the favour of one party, he quickly after fell under the displeasure of the other also. Supposing himself to be in too great subjection to his uncles, particularly the Duke of Gloucester, he attempted to shake off the yoke, by raising others to such a degree of power as might enable them to rival them. His first favourite was *Robert de Vere* Earl of Oxford, a young man of an agreeable person, but dissolute in his behaviour, who soon acquired an absolute ascendant over him. So much was he determined to show his attachment to this nobleman, that he first created him Marquis of Dublin, a title never known in England before; then Duke of Ireland; transferring to him the entire sovereignty of that island by patent for life. He gave him in marriage his cousin-german, the daughter of the Earl of Bedford; but soon after permitted him to divorce her for another lady with whom he had fallen in love. This nobleman soon became the dispenser of all the king's favours to such a degree, that a conspiracy was formed against him. At the head of which were, *Mowbray* Earl of Nottingham, *Fitz Alan* Earl of Arundel, *Percy* Earl of Northumberland, *Montacute* Earl of Salisbury, and *Beauchamp* Earl of Warwick. *Vere* was impeached in parliament; and tho' nothing of moment was even alleged against him, he was condemned and deprived of his office. They next proceeded to attack the royal authority itself. Under pretence that the king was yet unable to govern the kingdom, though at that time 21 years of age, they appointed a commission of 14 persons to whom the sovereignty was to be transferred for a year. This measure was driven forward by the duke of Gloucester, and none but his own faction were admitted as members of the committee. The king could not without regret perceive himself thus totally deprived of authority. He first endeavoured to gain over the parliament to his interests, by influencing the sheriffs of each county, who were then the only returning officers. This measure failing, he next applied to the judges. They declared, that the commission which had deprived the king of his authority was unlawful, and that those who procured or advised it were punishable with death. Their sentence was quickly opposed by declarations from the lords. The Duke of Gloucester armed his partisans; and appeared at *Haringay* park near Highgate,

England.

182
The king
loses the
favour of
the people.183
His excess-
sive favour
for the Earl
of Oxford.184
A conspi-
racy against
the king.

England.

Highgate, at the head of a body of men sufficient to intimidate the king and all his adherents. These insurgents, sensible of their own power, began by demanding of the king the names of those who had advised him to his late rash measures. A few days afterwards they appeared armed in his presence, and accused by name the Archbishop of York, the Duke of Ireland, the Earl of Suffolk, and Sir Robert Tresilian, one of the judges who had declared in his favour, together with Sir Nicholas Bember, as public and dangerous enemies to the state. The duke of Ireland fled into Cheshire, where he attempted to raise a body of forces; but was quickly obliged to fly into Flanders, on the arrival of the Duke of Gloucester with a superior army. Soon after, the king was obliged to summon a parliament, where an accusation was drawn up against five of his counsellors. Of these only Sir Nicholas Bember was present; and he was quickly found guilty, condemned, and executed, together with Sir Robert Tresilian, who had been discovered and taken during the interval. Lord Beauchamp of Holt was soon after condemned and executed; and Sir Simon Burley, who had been appointed the king's governor, shared the same fate, though the queen continued for three hours on her knees before the Duke of Gloucester, imploring his pardon.

185
The king
takes the
power into
his own
hands.

Such unparalleled insolence and barbarity in a subject could not go unpunished. In 1389, the king, at an extraordinary council of the nobility assembled after Easter, to the astonishment of all present, desired to know his age. Being told that he was turned of two and twenty, he alleged that it was then time for him to govern without help; and that there was no reason why he should be deprived of those rights which the meanest of his subjects enjoyed. The lords answered in some confusion, that he had certainly an undisputed right to take upon himself the government of the kingdom. "Yes (replied the king), I have long been under the government of tutors; and I will now first show my right to power by their removal." He then ordered Thomas Arundel, whom the commissioners had lately appointed chancellor, to give up the seals; which he next day delivered to William Wickham bishop of Winchester. He next removed the Duke of Gloucester, the Earl of Warwick, and other lords of the opposition, from the council; and all the great officers of the household, as well as the judges, were changed.

The king being thus left at liberty to govern as he thought proper, for some time behaved in such a manner as to gain the affections of the people. It does not appear indeed that he ever gave much cause of complaint; but it was impossible for any prince in those days to keep himself secure on the throne but by a very severe and vigorous administration. The Duke of Gloucester, perceiving that Richard was not of a warlike disposition, frequently spoke with contempt of his person and government, and deliberated concerning the lawfulness of throwing off all allegiance to him. The king being informed of his conduct by spies appointed for that purpose, at last formed a resolution of ridding himself of Gloucester and his faction at once. He therefore ordered that nobleman to be immediately arrested and sent over to Calais, where there was no danger of his being rescued by his numerous adherents. The

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earls of Arundel and Warwick were seized at the same time; and a new parliament, which the king knew would be perfectly obedient to his will, was summoned to Westminster. Here the commission of 14, who had usurped on the royal authority, was annulled for ever; all those acts which had condemned his former ministers were repealed; and the general pardon which the king had formerly given when he assumed the government into his own hands, was revoked. Several of Gloucester's party were condemned and executed, and at last that nobleman himself was called for to take his trial as well as the rest; but he had before been privately dispatched in prison.

After the destruction of the Duke of Gloucester and the heads of his party, a misunderstanding arose among the noblemen who had joined in the prosecution. The Duke of Hereford appeared in parliament, and accused the Duke of Norfolk of having spoken seditious words against his majesty in a private conversation. Norfolk denied the charge, gave Hereford the lie, and offered to prove his innocence by single combat. The challenge was accepted; but on the day appointed for the duel, the king would not suffer the combatants to engage, but commanded both of them to leave the kingdom. The Duke of Norfolk he banished for life, but the Duke of Hereford only for ten years. The former retired to Venice, where in a short time he died of a broken heart. Hereford behaved in a resigned and submissive manner; which so pleased the king, that he consented to shorten the time of his banishment four years: he also granted him letters patent, ensuring him of the enjoyment of any inheritance which should fall to him during his absence; but upon the death of his father the Duke of Lancaster, which happened shortly after, Richard revoked those letters, and kept the estate to himself.

This last injury inflamed the resentment of Hereford to such a degree, that he formed a design of dethroning the king. He was a great favourite both with the army and people; he was immensely rich, and connected by blood or alliance with all the great families of the nation. The king at the same time, it is said, gave himself up to an idle, effeminate life; and his ministers following his example, the national honour was lost. The number of malecontents daily increased, and only waited for the absence of the king, in order to put their schemes in execution; and this opportunity soon offered.

The Earl of March, presumptive heir to the crown, having been appointed the king's lieutenant in Ireland, was slain in a skirmish with the natives of that country; which so incensed Richard, that, unmindful of his precarious situation at home, he went over to Ireland with a considerable army, in order to revenge his death in person. The Duke of Lancaster (for that was the title which Hereford assumed on the death of his father) hearing of the king's absence, instantly embarked at Nantz; and with a retinue only of 60 persons in three small vessels, landed at Ravenspur in Yorkshire. The Earl of Northumberland, who had long been a malecontent, together with Henry Percy his son, who from his ardent valour was surnamed *Hotspur*, immediately joined him with their forces; and the people flocked to him in such numbers, that in a few days his army amounted to 60,000 men.

Richard,

England.

Richard, in the mean time, continued in perfect security in Ireland for some time. Contrary winds for three weeks together prevented his receiving any news of the rebellion which was begun in his native dominions. He landed therefore at Milford Haven without suspicion, attended by a body of 20,000 men; but immediately found himself opposed by a power which he could by no means resist. His army gradually deserted him, till at last he was obliged to acquaint the duke, that he would submit to whatever terms he pleased to prescribe. The duke did not think proper to enter into any treaty with the king; but carried him to London, where he was confined close prisoner in the Tower, formally deposed by parliament, or rather by the Duke of Lancaster, and at last put to death. The manner of his death is variously related. According to some, eight or nine ruffians were sent to the castle of Pomfret, whither the unhappy prince had been removed, in order to dispatch him. They rushed unexpectedly into his apartment; but Richard, knowing their design, resolved to sell his life as dear as possible. He wrested a pole-ax from one of the murderers, with which he killed four of them; but was at length overpowered and killed. Others relate that he was starved in prison; and that, after he was denied all nourishment, he prolonged his life 14 days, by feeding on the flocks of his bed. He died in the year 1399, in the 34th year of his age, and 23d of his reign.—It was during the reign of Richard II. that Wickliff, the noted reformer, published his doctrines in England. See WICKLIFF.

189
Richard de-
posed and
murdered.

190
Duke of
Lancaster's
claim to the
crown.

After sentence of deposition had been pronounced on Richard by both houses of parliament, the throne being then vacant, the Duke of Lancaster stepped forth; and having crossed himself on the forehead and on the breast, and called on the name of Christ, gave in his claim to the throne in the following words, which we shall give in the original language. "In the name of Father, Son, and Holy Ghost, I Henry of Lancaster, challenge this rewme of Ynglonde, and the croun, with all the membres and the appurtenances; als I that am descendit by right line of the blode, coming fro the gude King Henry therde, and throge that right that God of his grace hath sent me, with help of kyn, and of my frendes to recover it; the which rewme was in poynt to be ondone by default of governance, and ondoynge of the gude laws."

The right which the duke here claimed by descent from Henry III. proceeded on a false story that Edmund Earl of Lancaster, son of Henry III. was really the elder brother of Edward I.; but that, by reason of some deformity in his person, he had been postponed in the succession, and Edward the younger brother imposed on the nation in his stead. The present Duke of Lancaster inherited from Edmund, by his mother, the right which he now pretended to the crown; though the falsehood of the story was so generally known, that he thought proper to mention it only in general terms.—No opposition, however, was made to the validity of this title in parliament; and thus commenced the differences between the houses of York and Lancaster, which were not terminated but by many bloody and ruinous wars.

191
Henry IV.

The reign of Henry IV. was little else than a continued series of insurrections. In the very first parlia-
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ment he called, no fewer than 40 challenges were given and accepted by different barons; and though Henry had ability and address enough to prevent these duels from being fought, it was not in his power to prevent continual insurrections and combinations against himself. The most formidable one was conducted by the Earl of Northumberland, and commenced A. D. 1402. The occasion of it was, that Henry denied the Earl liberty to ransom some Scots prisoners which had been taken in a skirmish with that nation. The king was desirous of detaining them in order to increase his demands upon Scotland in making peace; but as the ransom of prisoners was in that age looked upon as a right belonging to those who had taken them, the earl thought himself grievously injured. The injury appeared still the greater, because Northumberland considered the king as indebted to him both for his life and crown. He resolved therefore to dethrone Henry; and to raise to the throne young Mortimer, who was the true heir to the crown, as being the son of Roger Mortimer Earl of March, whom Richard II. had declared his successor. For this purpose he entered into an alliance with the Scots and Welsh, who were to make an irruption into England at the same time that he himself was to raise what forces he could in order to join them. But when all things were prepared for this insurrection, the Earl found himself unable to lead on the troops, by a sudden fit of illness with which he was seized at Berwick. On this, young Piercy (surnamed *Hotspur*) took the command; and marched towards Shrewsbury, in order to join the Welsh. But the king had happily a small army with which he intended to have acted against the Scots; and knowing the importance of celerity in civil wars, instantly hurried down, that he might give battle to the rebels. He approached Shrewsbury before a junction with the Welsh could be effected; and the impatience of Piercy urged him to an engagement, which at that time he ought to have declined. The evening before the battle, he sent a manifesto to Henry; in which he renounced his allegiance, set the king at defiance, and enumerated all the grievances of which he imagined the nation might justly complain. He reproached him (and very justly) with his perjury; for Henry, on his first landing in England, had sworn upon the gospels, before the Earl of Northumberland, that he had no other intention but to recover possession of the duchy of Lancaster, and that he would ever remain a faithful subject to King Richard. He aggravated his guilt, in first dethroning and then murdering that prince; and in usurping on the title of the house of Mortimer; to whom, both by lineal succession and by declarations of parliament, the throne, then vacant by Richard's death, did of right belong. Several other heavy charges were brought against him; which, at that time, could be productive of no other effect than to irritate the king and his adherents to the utmost.

The armies on each side were in number about 12,000; so that they were not unmanageable by their commanders; and as both leaders were men of known bravery, an obstinate engagement was expected. The battle was fought on the 20th of July 1403; and we can scarce find in those ages any other in which the shock was so terrible and constant. At last Piercy being killed by an unknown hand, the victory was de-

England.

192
Insurrec-
tion of the
Earl of
Northum-
berland.

193

His son de-
feated and
killed at
Shrews-
bury.

England. sided in favour of the royalists. There are said to have fallen on that day near 2300 gentlemen, and 6000 private men, of whom near two thirds were of Piercy's army.

The Earl of Northumberland having recovered from his sickness, and levied an army, was on his march to join his son; but being opposed by the Earl of Westmoreland, and hearing of the defeat at Shrewsbury, he dismissed his forces, and came with a small retinue to the king at York. He pretended that his sole intention was to mediate between the contending parties; and the king thought proper to accept of his apology, and grant him a pardon for his offence. The other rebels were treated with equal lenity; and none of them, except the Earl of Worcester and Sir Richard Vernon, who were regarded as the chief authors of the insurrection, perished by the hands of the executioner. This lenity, however, was not sufficient to keep the kingdom quiet; one insurrection followed another almost during the whole of this reign; but either through Henry's vigilance, or the bad management of the conspirators, they never could unite their forces in such a manner as was necessary for bringing their projects to bear.

194
Archbishop
of York ex-
ecuted.

195
Burning of
heretics in-
troduced.

This reign is remarkable for the first capital punishment inflicted on a clergyman of high rank. The Archbishop of York having been concerned in an insurrection against the king, and happening to be taken prisoner, was beheaded without either indictment, trial, or defence; nor was any disturbance occasioned by this summary execution. But the most remarkable transaction of this reign was, the introduction of that absurd and cruel practice of burning people on account of their religion. Henry, while a subject, was thought to have been very favourable to the doctrines of Wickliffe; but when he came to the throne, finding his possession of it very insecure, he thought superstition a necessary implement of his authority, and therefore determined by all means to pay court to the clergy. There were hitherto no penal laws against heresy; not indeed through the toleration of the court of Rome, but through the stupidity of the people, who could not perceive the absurdities of the established religion. But when the learning and genius of Wickliffe had once broken the fetters of prejudice, the ecclesiastics called aloud for the punishment of his disciples; and Henry, who was very little scrupulous in his conduct, resolved to gratify them. He engaged parliament to pass a law for this purpose: it was enacted, that when any heretic, who relapsed, or refused to abjure his opinions, was delivered over to the secular arm by the bishop or his commissaries, he should be committed to the flames before the whole people. This weapon did not remain long unemployed in the hands of the clergy. William Sautré, rector of St Olithes in London, had been condemned by the convocation of Canterbury; his sentence was ratified by the house of Peers; the king issued his writ for the execution; and the unhappy man was burnt alive in the year 1401. The doctrines of Wickliffe, however, seem to have already gained ground very considerably in England. In 1405, the commons, who had been required to grant supplies, proposed in plain terms to the king to seize all the temporalities of the church, and employ them as a perpetual fund to serve the exigencies of the state. They insisted that

the clergy possessed a third of the lands of the kingdom; and they contributed nothing to the public burdens; and that their exorbitant riches tended only to disqualify them from performing their ministerial functions with proper zeal and attention. When this address was presented, the Archbishop of Canterbury, who then attended the king, objected that the clergy, though they went not in person to the wars, sent their vassals and tenants in all cases of necessity; while at the same time, they themselves who staid at home were employed night and day in offering up their prayers for the happiness and prosperity of the state. The speaker answered with a smile, that he thought the prayers of the church but a very slender supply. The archbishop, however, prevailed in the dispute; the king discouraged the application of the commons; and the lords rejected the bill which the lower house had framed for despoiling the church of her revenues. The commons were not discouraged by this repulse. In 1410, they returned to the charge with more zeal than before. They made a calculation of all the ecclesiastical revenues, which, by their account, amounted to 485,000 marks a-year, and included 18,400 ploughs of land. They proposed to divide this property among 15 new earls, 1500 knights, 6000 esquires, and 100 hospitals; besides 20,000 pounds a-year, which the king might keep for his own use: and they insisted that the clerical functions would be better performed than at present, by 15,000 parish-priests, at the rate of 7 marks a-piece of yearly stipend. This application was accompanied with an address for mitigating the statutes enacted against the Wickliffites or Lollards, so that the king knew very well from what source it came. He gave the commons, however, a severe reply; and further to satisfy the church that he was in earnest, ordered a Lollard to be burnt before the dissolution of parliament.

The king had been for some time subject to fits, which continued to increase, and gradually brought him to his end. He expired at Westminster in 1413, in the 46th year of his age, and the 13th of his reign. He was succeeded by his son Henry V. whose martial talents and character had at first occasioned unreasonable jealousies in the mind of his father, so that he thought proper to exclude him from all share of public business. The active spirit of Henry being thus restrained from its proper exercise, broke out in every kind of extravagance and dissipation. It is even reported, that, when heated with liquor, he scrupled not to accompany his riotous associates in attacking the passengers on the streets and highways, and robbing them of their goods. No sooner, however, did he ascend the throne, than he called together his former companions, acquainted them with his intended reformation, exhorted them to imitate his example; but strictly prohibited them, till they had given proofs of their sincerity in this particular, to appear any more in his presence: after which, he dismissed them with liberal presents. His father's wise ministers, who had checked his riots, found that they had, unknown to themselves, been paying the highest court to their sovereign; and were received with all the marks of favour and confidence. The chief justice, who had formerly imprisoned the prince himself, and therefore trembled to approach the royal presence, met with

196

Henry V.

praises

England. praises instead of reproaches for his past conduct, and was exhorted to persevere in the same rigorous and impartial execution of the laws. The king was not only anxious to repair his own misconduct, but also to make amends for those iniquities into which policy or necessity of affairs had betrayed his father. He expressed the deepest sorrow for the fate of the unhappy King Richard, and even performed his funeral obsequies with pomp and solemnity, and heaped favours upon all those who had shown themselves attached to him. He took into favour the young Earl of March, though his competitor for the throne; and gained so far on his gentle and unambitious nature, that he remained ever after sincerely attached to him. The family of Piercy was restored to its fortune and honours; and the king seemed desirous to bury all distinctions in oblivion. Men of merit were preferred, whatever party they had been of; all men were unanimous in their attachment to Henry; and the defects of his title were forgot amidst the personal regard which was universally paid him.

197
Enforces
the laws a-
gainst here-
tics.

The only party which Henry was not able to overcome was the new sect of Lollards, or reformers of religion. These were now gaining such ground in England, that the Romish clergy were greatly alarmed, and Henry was determined to execute the laws upon them. The head of that party at present was Sir John Oldcastle, Lord Cobham; a nobleman who had distinguished himself by his valour and military talents on many occasions, and acquired the esteem both of the late and present king. His high character and zeal for the new sect pointed him out to Arundel Archbishop of Canterbury as a proper object of ecclesiastical fury, and therefore he applied to Henry for permission to indict him. The king desired him first to try gentle methods, and undertook to converse with Lord Cobham himself upon religious subjects. He did so, but could not prevail, and therefore abandoned Cobham to his enemies. He was immediately condemned to the flames: but having found means to make his escape, he raised an insurrection; which was soon suppressed, without any other consequence than that of bringing a stain on the sect to which he belonged. Cobham himself made his escape, but four years afterwards was taken and executed as a traitor. Immediately after, the most severe laws were enacted against the Lollards. It was enacted, that whoever was convicted of Lollardy, besides suffering capital punishment according to the laws formerly established, should also forfeit his lands and goods to the king; and that the chancellor, treasurer, justices of the two benches, sheriffs, justices of the peace, and all the chief magistrates in every city and borough, should take an oath to use their utmost endeavours for the extirpation of heresy.

Notwithstanding these terrible laws, the very parliament which enacted them, namely that of 1414, when the king demanded a supply, renewed the offer formerly pressed upon Henry IV. and intreated the king to seize all the ecclesiastical revenues, and convert them to the use of the crown. The clergy were greatly alarmed. They could offer the king nothing of equal value. They agreed, however, to confer on him all the priories alien, which depended on capital abbeys in Normandy, and which had been bequeathed to them

when that province was united to England. The most effectual method, however, of warding off the blow at present was by persuading the King to undertake a war with France, in order to recover the provinces in that kingdom which had formerly belonged to England. This was agreeable to the dying injunction of Henry IV. He advised his son never to let the English remain long in peace, which was apt to breed intestine commotions; but to employ them in foreign expeditions, by which the prince might acquire honour, the nobility in sharing his dangers might attach themselves to his person, and all the restless spirits find occupation for their inquietude. The natural disposition of Henry sufficiently inclined him to follow this advice, and the civil disorders of France gave him the fairest prospect of success. Accordingly, in 1415, the king invaded France at the head of 30,000 men. The great progress he made there is related at length under the article FRANCE. He had espoused the king's daughter, and conquered the greatest part of the kingdom. His queen was delivered of a son named Henry, whose birth was celebrated by the greatest rejoicings both at London and Paris; and the infant prince seemed to be universally regarded as heir to both monarchies. But Henry's glory, when it seemed to be approaching the summit, was blasted at once by death, and all his mighty projects vanished. He was seized with a fistula, a distemper which at that time the physicians had not skill enough to cure; and he expired on the 31st of August 1422, in the 34th year of his age, and the 10th of his reign.

England.

198
France in-
vaded.

199
Death of
Henry V.

Henry VI. succeeded to the throne before he was quite a year old, and his reign affords only the most dismal accounts of misfortunes and civil wars. His relations very soon began to dispute about the administration during the minority. The Duke of Bedford, one of the most accomplished princes of the age, was appointed by parliament protector of England, defender of the church, and first counsellor to the king. His brother, the Duke of Gloucester, was fixed upon to govern in his absence, while he conducted the war in France; and in order to limit the power of both brothers, a council was named, without whose advice and approbation no measure could be carried into execution.

The kingdom of France was now in the most desperate situation. The English were masters of almost the whole of it. Henry VI. though but an infant, was solemnly invested with regal power by legates from Paris; so that Charles VII. of France succeeded only to a nominal kingdom. With all these great advantages, however, the English daily lost ground; and in the year 1450 were totally expelled from France †. It may easily be imagined, that such a train of bad success would produce discontents among the rulers at home. The Duke of Gloucester was envied by many on account of his high station. Among these was Henry Beaufort, Bishop of Winchester, great uncle to the king, and the legitimate son of John of Gaunt brother to Richard II. The prelate, to whom the care of the king's education had been committed, was a man of great capacity and experience, but of an intriguing and dangerous disposition. He had frequent disputes with the Duke of Gloucester, over whom he gained several advantages on account of his open temper. The Duke of Bed-

200
Henry VI.

† See
France.

England. ford employed both his own authority and that of parliament to reconcile them, but in vain; their mutual animosities served for several years to embarrass government, and to give its enemies every advantage. The sentiments of the two leaders were particularly divided with regard to France. The bishop laid hold of every prospect of accommodation with that country; and the Duke of Gloucester was for maintaining the honour of the English arms, and regaining whatever had been lost by defeats or delay. Both parties called in all the auxiliaries they could. The bishop resolved to strengthen himself by procuring a proper match for Henry, at that time 23 years old; and then bringing over the queen to his interests. Accordingly, the Earl of Suffolk, a nobleman whom he knew to be steadfast in his attachments, was sent over to France, apparently to settle the terms of a truce which had then been begun, but in reality to procure a suitable match for the king.

201
Married to
Margaret of
Anjou.

The bishop and his friends had cast their eye on Margaret of Anjou, daughter of Regnier, titular king of Sicily, Naples, and Jerusalem; but without either real power or possessions. She was considered as the most accomplished princess of the age, both in mind and person; and it was thought would, by her own abilities, be able to supply the defects of her husband, who appeared weak, timid, and superstitious. The treaty was therefore hastened on by Suffolk, and soon after ratified in England. The queen came immediately into the bishop's measures: Gloucester was deprived of all real power, and every method taken to render him odious to the public. One step taken for this purpose was to accuse his duchess of witchcraft. She was charged with conversing with one Roger Bolingbroke, a priest and reputed necromancer; and also with one Mary Gourdmain, who was said to be a witch. It was asserted that these three in conjunction had made an image of the king in wax, which was placed before a gentle fire; and as the wax dissolved, the King's strength was expected to waste; and upon its total dissolution, his life was to be at an end. This accusation was readily believed in that superstitious age. The prisoners were pronounced guilty; the duchess was condemned to do penance and suffer perpetual imprisonment; Bolingbroke the priest was hanged, and the woman burnt in Smithfield.

202
Duke of
Gloucester
murdered.

The bishop, called also the *Cardinal*, of Winchester, was resolved to carry his resentment against Gloucester to the utmost. He procured a parliament to be summoned, not at London, which was too well affected to the duke, but at St Edmundsbury, where his adherents were sufficiently numerous to overawe every opponent. As soon as Gloucester appeared, he was accused of treason and thrown into prison; and on the day on which he was to make his defence, he was found dead in his bed, though without any signs of violence upon his body.

The death of the Duke of Gloucester was universally ascribed to the Cardinal of Winchester, who himself died six weeks after, testifying the utmost remorse for the bloody scene he had acted. What share the queen had in this transaction, is uncertain; but most people believed that without her knowledge the duke's enemies durst not have ventured to take away his life. The king himself shared in the general ill-will, and he

never had the art to remove the suspicion. His incapacity also began every day to appear more clearly, and a pretender to the throne soon made his appearance.

In the year 1450, Richard Duke of York began to think of preferring his claims to the crown. All the males of the house of Mortimer were extinct; but Anne, the sister of the last Earl of March, having espoused the Earl of Cambridge, who had been beheaded for treason in the reign of Henry V. had transmitted her latent, but not yet forgotten claim, to her son Richard. This prince, descended by his mother from Philippa only daughter of the Duke of Clarence, second son of Edward III. stood plainly in order of succession before the King; who derived his descent from the duke of Lancaster, third son of that monarch. The duke was a man of valour and abilities, as well as of some ambition; and he thought the weakness and unpopularity of the present reign afforded a favourable opportunity to assert his title. The ensign of Richard was a white rose, that of Henry a red one; and this gave names to the two factions, who were now about to drench the kingdom in blood.

After the Cardinal of Winchester's death, the Duke of Suffolk, who also had been concerned in the assassination of Gloucester, governed every thing with uncontrollable sway. His conduct soon excited the jealousy of the other nobility, and every odious or unsuccessful measure was attributed to him. The duke, however, imagining that his crimes were of such a nature as could not be proved, boldly called upon his enemies to show an instance of his guilt. The house of commons immediately opened against him a charge of corruption, tyranny, and treason. He was accused of being the cause of the loss of France; of persuading the French king, with an armed force, to invade England; and of betraying the secrets of state. The popular resentment against him was so strong, that Henry, in order to secure him as much as possible, sentenced him to five years banishment. This was considered by his enemies as an escape from justice. The captain of a ship was therefore employed to intercept him in his passage to France. He was seized near Dover, his head struck off on the side of a long boat, and his body thrown into the sea.

The complaints against Henry's government were heightened by an insurrection headed by one John Cade, a native of Ireland. He had been obliged to fly over into France for his crimes; but, on his return, seeing the people prepared for violent measures, he assumed the name of *Mortimer*; and, at the head of 20,000 Kentish men, advanced towards Blackheath. The king sent a message to demand the cause of their rising in arms. Cade in the name of the community answered, That their only aim was to punish evil ministers, and procure a redress of grievances for the people. On this a body of 15,000 troops were levied, and Henry marched with them in person against Cade, who retired on his approach, as if he had been afraid of coming to an engagement. He lay in ambush, however, in a wood; not doubting but he should be pursued by the king's whole army: but Henry was content with sending a detachment after the fugitives, and returning to London himself; upon which Cade issued from his ambuscade, and cut the detachment in pieces.

Soon.

England.

Soon after, the citizens of London opened their gates to the victor; and Cade, for some time, maintained great order and regularity among his followers. He always led them out into the fields in the night-time, and published several edicts against plunder and violence of any kind. He was not, however, long able to keep his people in subjection. He beheaded the treasurer Lord Say, without any trial; and soon after, his troops committing some irregularities, the citizens resolved to shut their gates against him. Cade endeavouring to force his way, a battle ensued, which lasted all day, and was ended only by the approach of night. The Archbishop of Canterbury, and the chancellor, who had taken refuge in the Tower, being informed of the situation of affairs, drew up, during the night, an act of amnesty, which was privately dispersed among the rebels. This had such an effect, that in the morning Cade found himself abandoned by his followers; and retreating to Rochester, was obliged to fly alone into the woods. A price being set on his head by proclamation, he was discovered and slain by one Alexander Eden; who, in recompence for this service, was made governor of Dover castle.

207
Duke of
York sus-
pected by
the court.

The court now began to entertain suspicions that the insurrection of John Cade had not happened merely in consequence of his own machinations and ambition, but that he had been instigated thereto by the Duke of York, who, as we have already seen, pretended a right to the crown. As he was about this time expected to return from Ireland, and a report took place that he was now to assert his supposed right by force of arms, orders were issued in the king's name to deny him entrance into England. This was prevented by his appearing with no more than his ordinary attendants; but though he thus escaped the danger for the present, he instantly saw the necessity of proceeding in support of his claim. His partizans were instructed to distinguish between his right by succession and by the laws of the kingdom. The adherents of Lancaster maintained, that though the advancement of Henry IV. might be looked upon as irregular, yet it was founded upon general consent; or even allowing it to have been at first invalid, it had now been for a long time established, and acquired solidity of consequence; nor could the right of succession at any rate be pleaded for the purpose of overthrowing the general peace and tranquillity of the kingdom. The principles of liberty as well as the maxims of true policy had been injured by the house of York; while the public were bound to those of Lancaster, no less by political than moral duty, in consequence of the oaths of fealty that had been so often sworn to them; the Duke of York himself having repeatedly sworn allegiance to them, and thus indirectly renounced those claims which he now brought forward to disturb the public tranquillity. On the part of the Duke of York, it was replied, that the good of the people required the maintenance of order in the succession of princes; that, by adhering constantly to this rule, a number of inconveniences would be prevented which must otherwise ensue; and though that order had been broken through in the case of Henry IV. it was never too late to remedy any pernicious precedent. It would indeed be a great encourage-

208
Arguments
for and a-
gainst the
houses of
York and
Lancaster.

ment to usurpers, if the immediate possession of power, or their continuance in it for a few years, could convert them into legal princes; and the people must be in a very miserable situation, if all restraints on violence and ambition were taken off, and full liberty given to every innovator to make what attempts he pleased. They did not indeed deny that time might confer solidity on a government originally founded in usurpation; but a very long course of years was not only required for this purpose, but a total extinction of those who had any just title. The deposition of Richard II. and advancement of Henry IV. were not legal acts, but the effects of mere levity in the people; in which the house of York had acquiesced from necessity, and not from any belief of the justice of their cause; nor could this be ever interpreted into any renunciation of their pretensions; neither could the restoration of the true order of succession be considered as an encouragement to rebellion and turbulence, but the correction of a former abuse by which rebellion had been encouraged. Besides, the original title of Henry IV. was founded entirely on present convenience; and even this was now entirely shifted to the house of York. The present prince was evidently incapable of governing the kingdom by reason of his imbecillity; so that every thing was governed either by corrupt ministers or an imperious queen, who engaged the nation in foreign connections entirely contrary to its interests; while on the other hand, the true heir of the crown was a prince of approved judgment and experience, and a native of England, who, by his restoration, would undoubtedly correct all those abuses of which there was now such just reason to complain.

In this dispute it was evident that the house of York had the better in point of argument: nevertheless, as a prince of the house of Lancaster was in immediate possession of the throne, and could by no means be charged with any crime, the cause of the former was less generally interesting; especially as it must always have been uncertain, *a priori*, whether the Duke of York would have governed any better than King Henry. After his return from Ireland, however, the former used all his power and influence to foment the discontents which had for some time prevailed in the kingdom; and the conduct of the next parliament manifested the success of his intrigues. A violent attack was made upon such noblemen as were known to be most in favour with the king. The house of commons presented a petition against the Duke of Somerset, the Dukes of Suffolk, the Bishop of Chester, Lord Dudley, and several others of inferior rank; praying not only that the king would remove them from his council, but that he would prohibit them from coming within twelve miles of the court. Henry not daring to refuse this petition altogether, consented to banish all those of inferior rank, whom the commons had specified, but only for a year; and this too on condition that he had no use for their assistance in quelling any rebellion. But he rejected a bill for attainting the late Duke of Suffolk, and proposed some other measures which seemed to militate against the court, though it had passed both the house of lords and the house of commons.

Encouraged by this disagreement between Henry and

England.

209
The Duke
of York
foments
dissensions
between
the king
and parlia-
ment.

England.

210
Richard
raises an
army;

211
But is obli-
ged to re-
tire.

212
He is ap-
pointed
protector
in conse-
quence of
the king's
illness.

213
Is deposed
and levies
an army.

214
History of
the civil
war be-
tween Hen-
ry and the
Duke of
York.

and his parliament, the Duke of York raised an army of 10,000 men, with whom he marched towards London, demanding a reformation in matters of government, and the removal of the Duke of Somerset.

This first enterprise, however, proved unsuccessful; the gates of the city were shut against him, and he was pursued by the king at the head of a superior army.

On this he retired into Kent; and as there was a number of his own friends in the army of the king, a conference took place, in which Richard still insisted upon the removal of the Duke of Somerset, and his submitting to be tried in parliament. This request was in appearance complied with, and Somerset arrested: the Duke of York was then persuaded to wait upon the king in his royal pavilion; but, on repeating his charge against the duke, he was surprised to see the latter come out from behind the curtain, and offer to maintain his innocence. Richard perceiving that he had not sufficient interest to ruin his adversary, pretended to be satisfied, and retired to his seat at Wigmore in Wales; and during the time he resided there, a better opportunity was given him of accomplishing his designs than he could have hoped for. The king fell into a kind of lethargic disorder, which increased his natural imbecillity to such a degree, that he could no longer retain a shadow of royalty. Richard now had interest enough to get himself appointed protector, with power to hold parliaments at pleasure; with which high office he was no sooner invested, than he turned out all the Lancastrian party from their offices, and sent the Duke of Somerset to the Tower; but on the recovery of the king, which happened in no long time after, he himself was dismissed from his employment, the Duke of Somerset released, and the administration once more put into his hands. On this the duke of York levied an army, merely, as he pretended, to enforce the reformation of government and the removal of the Duke of Somerset. Thus Henry, though sore against his will, was obliged to face him in the field. A battle ensued at St Alban's; in which the royalists were defeated, and the Duke of Somerset, the chief partisan of their cause, killed in the action. The king himself was wounded, and took shelter in a cottage near the field of battle; where he was taken prisoner, but was afterwards treated with great respect and kindness by the Duke of York.

Henry, though he was now only a prisoner treated with the forms of royalty, was nevertheless pleased with his situation; but his queen, a woman of a bold and masculine spirit, could not bear to have only the appearance of authority, while others enjoyed all the real power. She therefore excited the king once more to assert his right by force of arms; and after several manœuvres, the Duke of York was obliged to retire from court. A negotiation for peace was at first set on foot, but the mutual distrusts of both parties soon broke it off. The armies met at Bloreheath on the borders of Staffordshire, on the 23d of September 1459; and the Yorkists at first gained some advantages. But when a more general engagement was about to ensue, a body of veterans who served under the Duke of York deserted to the king; and this so intimidated the duke's party, that they separated the next day without striking a blow. The

Duke of York fled to Ireland; and the Earl of Warwick, one of his ablest and best supporters, escaped to Calais, with the government of which he had been entrusted during the late protectorship.

The York party, though thus in appearance suppressed, only waited a favourable opportunity of retrieving their affairs. Nor was this opportunity long wanting. Warwick having met with some successes at sea, landed in Kent; and being there joined by other barons, marched up to London amidst the acclamations of the people. The city immediately opened its gates to him, and he soon found himself in a condition to face the royal army. An engagement ensued at Northampton on the 10th of July 1460; in which the royalists were entirely defeated, and the king again taken prisoner. The Duke of York then openly laid claim to the crown; and on this occasion the first instance of a spirit of national liberty is said to have appeared in the House of Lords. The cause of Henry and the Duke of York was solemnly debated; and the latter, though a conqueror, did not absolutely gain his cause. It was determined that Henry should possess the throne during his life; and that the Duke of York should be appointed his successor, to the utter exclusion of the Prince of Wales, who was then a child.

Though the royal party now seemed destitute of every resource, the queen still retained her intrepidity. She fled into Wales, where she endeavoured to raise another army. The northern barons, provoked at the southern ones for settling the government and succession to the crown without their consent, soon furnished her with an army of 20,000 men. Another battle was fought near Wakefield Green, on the 24th of December 1460. The Yorkists were defeated, and the duke himself was killed in the action. His head was afterwards cut off by the queen's orders, and fixed on one of the gates of York, with a paper-crown, in derision of his pretended title. His son the Earl of Rutland, a youth of 17, was taken prisoner, and killed in cold blood by Lord Clifford, in revenge for his father's death, who had fallen in the battle of St Alban's.

After this victory, Margaret marched towards London, in order to set the king at liberty; but the Earl of Warwick, who now put himself at the head of the Yorkists, led about the captive king, in order to give a sanction to his proceedings. He engaged the queen's forces at St Alban's; but through the treachery of Lord Lovelace, who deserted during the heat of the engagement with a considerable body of forces, Warwick was defeated, and the king fell once more into the hands of his own party.

The submission of the city of London seemed now to be the only thing wanting to complete the queen's success; but Warwick had secured it in his interests, and the citizens refused to open their gates to the queen. In the mean time, young Edward, eldest son of the late Duke of York, put himself at the head of his father's party. He was now in the bloom of youth, remarkable for the beauty of his person and his bravery, and was a great favourite of the people. He defeated Jasper Tudor Earl of Pembroke, at Mortimer's cross in Herefordshire. The earl himself was taken prisoner, and immediately beheaded by Edward's orders.

England.

215
Duke of
York kill-
ed.

England. ders. After this, he advanced to London; and being
 216 joined by the remainder of Warwick's army, he soon
 Edward IV. obliged Margaret to retire, entered the city amidst the
 acclamations of the people, and was crowned king on
 the 5th of March 1461.

Notwithstanding all her misfortunes, however, Mar-
 garet still continued undaunted. She retired to the
 north, where she was soon joined by such numbers,
 217 that her army amounted to 60,000 men. She was
 Affairs of the queen totally ruin-
 ed. opposed by young Edward and Warwick at the head
 of 40,000; and both armies met near Toton in the
 county of York, on the 29th of March 1461. A
 bloody battle ensued, in which the queen's army was
 totally defeated; and as Edward, prompted by his nat-
 ural cruelty, had ordered no quarter to be given,
 40,000 of the Lancastrians were slain in the field or in
 the pursuit. Edward is said to have gained this vic-
 tory by means of a violent storm of snow, which blew
 full in the face of the queen's army, and so blinded
 them that they could scarce make any use of their
 arms. After this disaster the queen fled to Scotland
 with her husband and son; and notwithstanding all the
 misfortunes she had already met with, resolved once
 more to enter England at the head of 5000 men
 granted her by the king of France. But even here she
 was attended by her usual bad fortune. Her little
 fleet was dispersed by a tempest, and she herself es-
 caped with the utmost difficulty by entering the mouth
 of the Tweed. Soon after, a defeat, which her few
 forces sustained at Hexham, seemed to render her
 cause entirely desperate; and the cruelties practised
 upon all her adherents rendered it very dangerous to
 befriend her.

218 By these repeated misfortunes the house of Lancas-
 Adventures of the king and queen, ter was so effectually ruined, that Margaret was obliged
 to separate from her husband, and both of them to
 shift for themselves the best way they could. The king
 was still protected by some of his friends, who convey-
 ed him to Lancashire, where he remained in safety for
 a twelvemonth; but being at last discovered, he was
 thrown into the Tower and kept close prisoner. The
 queen fled with her son to a forest, where she was set
 upon by robbers, who stripped her of her rings and
 jewels, treating her otherwise with the utmost indigui-
 ty. A quarrel which happened among them about the
 division of the spoil afforded her an opportunity of es-
 caping from their hands into another part of the forest,
 where she wandered for some time without knowing what
 to do. At last, when quite spent with hunger and fa-
 tigue, she saw a robber coming up to her with a drawn
 sword in his hand. Finding it altogether impossible to
 escape, she suddenly took the resolution of putting her-
 self under his protection. Advancing towards him,
 therefore, and presenting the young prince, "Here
 (says she), my friend, I commit to your care the safety
 of your king's son." This address so much surprised
 the robber, that, instead of offering her any injury, he
 professed himself entirely devoted to her service. After
 living for some time concealed in the forest, she was at
 last conducted to the sea-side, where she found a ship
 219 which conveyed her to Flanders. On her arrival there,
 The queen retires to Flanders. she went to her father's house, who, though very poor,
 gave her such entertainment as he could afford; and in
 this retreat she staid some years in expectation of find-
 ing an opportunity of retrieving her affairs.

Edward, in the mean time, thinking himself se- England.
 curely fixed on the throne, gave a loose to his fa-
 vourite passions; one of which was an immoderate love
 of women. To divert him from this, the Earl of
 Warwick, to whom he was indebted for his crown, ad- 220
 vised him to marry. Edward consented, and sent him Warwick
 over to the continent to negotiate a match with the disgusted by
 princess of Savoy. The negotiation proved successful; Edward.
 but, in the mean time, the king had privately espoused
 Elizabeth Woodville, daughter of Sir Philip Wood-
 ville, who had married the Duchess of Bedford after the
 death of her first husband. Edward had employed his
 arts of seduction against this lady in vain before he
 married her; but unfortunately the match was conclu-
 ded just at the time that the Earl of Warwick had pro-
 ved successful in his negotiation with the princess of
 Savoy. The minister therefore returned full of indig-
 nation against his sovereign: and Edward, forgetting
 how great cause he had to be offended, determined to re-
 move him entirely from his councils. Warwick was like-
 wise disgusted by the favour shown to the queen's par-
 ty; which, though certainly a piece of very commend-
 able policy in Edward, was entirely disagreeable to the
 ambitious disposition of that nobleman. A plan of re-
 venge was therefore thought of; and a most powerful
 combination was formed against Edward: to accomplish
 which, Warwick not only employed his own influence,
 which was very extensive, but likewise that of the Duke
 of Clarence, Edward's brother, to whom the earl had al- 221
 lied himself by giving him his daughter in marriage; after The king's
 which he persuaded him to embrace his cause. Some cir- brother
 cumstances which took place about this time also favour- joins in the
 ed the scheme. The inhabitants about St Leonard's in conspiracy
 222 An insur-
 rection in
 Yorkshire. Yorkshire complained, that the duties levied for that in-
 stitution, and which had been originally appointed for
 pious purposes, were secreted by the managers, who
 refused to contribute their part. As the clergy were
 concerned in this affair, they attempted to silence their
 antagonists by ecclesiastical fulminations against them;
 upon which the latter took up arms, fell upon the offi-
 cers of the hospital, and having massacred them, pro-
 ceeded towards York, to the number of 15,000. In
 the first skirmish, they had the misfortune to lose
 their leader, who was instantly executed. The rebels,
 however, still continued in arms, and in a short time
 appeared in such numbers as to become formidable
 to government. Henry Earl of Pembroke was sent
 against them with a body of 5000 men; and having
 taken Sir Henry Nevil, one of the leaders of the insur-
 gents, prisoner, instantly put him to death; but this
 was soon revenged by a similar execution on himself,
 who happened to be defeated and taken prisoner a short
 time after. This defeat had been occasioned by a dis-
 agreement betwixt the Earls of Pembroke and Devon-
 shire; in consequence of which the latter had gone off
 with his troops, leaving Pembroke to shift for himself
 the best way he could. The king, enraged at this,
 caused Devonshire to be executed in a like summary
 manner: but this was of no service to his cause; a new
 body of insurgents appeared under Sir Robert Welles,
 son to a nobleman of that name. The latter, in order
 to secure himself from all suspicions of disloyalty, fled
 to a monastery; but he was soon enticed from thence
 and put to death by the insidious promises of king Ed-
 ward, whose treachery was equal to his cruelty. His
 son

England. son soon after shared the same fate, being defeated and taken prisoner by Edward, who instantly ordered him to be beheaded, along with Sir Thomas Launde and other persons of distinction.

223
Warwick
and Cla-
rence join
the insur-
gents.

Notwithstanding such an appearance of a general insurrection, the king had so little suspicion of the loyalty of Warwick and Clarence, that he employed them in raising troops to quell the insurgents. Instead of executing their commission with fidelity, however, they joined the malecontents with all the forces they could raise; but being quite disconcerted by the defeat and death of Sir Robert Welles, they retired to Lancashire, in hopes of being joined by Lord Stanley, who had married the Earl of Warwick's sister. Being disappointed in this, they were obliged to disband their army, and fly into Devonshire, whence they set sail for Calais. Upon their arrival on the continent, matters seemed not to be much mended: the deputy-governor, whom Warwick had left, refused him admittance; nor would he even allow the Duchess of Clarence to land, though she had been delivered of a son on board only a very few days before, and was at that time extremely ill. Being well acquainted, however, with the uncertainty of the affairs of England at that time, he afterwards made an apology to Warwick for this behaviour. The latter pretended to be easily reconciled; but immediately left the place, having seized some Flemish vessels which he found lying in the neighbourhood.

224
Reconcilia-
tion be-
twixt War-
wick and
the queen.

As a very close alliance subsisted between Warwick and the Duke of Burgundy, the king of France became uneasy; and therefore, as soon as the earl landed on his dominions, received him with the greatest marks of esteem. The reconciliation betwixt him and the unfortunate Queen Margaret now seemed to be natural, though, considering all circumstances, this must have formerly appeared in a manner impossible. The earl's father had been put to death by the orders of Margaret; and Warwick, in return, had twice taken prisoner King Henry, banished the queen, and put to death almost all their faithful adherents. By the mediation of the French monarch, however, all differences were accommodated. A fleet was prepared to reconduct them to England; and seizing a proper opportunity, they landed at Dartmouth with a small body of troops, while Edward was in the north suppressing an insurrection which had lately appeared there. Warwick was attended with astonishing success on his arrival in England, and in less than six days saw himself at the head of 60,000 men. Edward was now obliged in his turn to fly the kingdom. Having narrowly escaped an attempt made upon his person by the Marquis of Montague, he embarked on board a small fleet which lay off Lynn in Norfolk. While at sea, he was chased by some ships belonging to the Hans Towns that were then at war both with France and England; but at length, having escaped all dangers, Edward landed safely in Holland, where he met with but an indifferent reception from the Duke of Burgundy, with whom he had lately entered into an alliance.

225
He lands
in Eng-
land.

Warwick in the mean time advanced to London, and once more released and placed on the throne the miserable king Henry VI. A parliament was called, which very solemnly confirmed Henry's title to the throne, and Warwick himself was dignified by the people with the title of the *king-maker*. All the at-

No 116.

tainders of the Lancastrians were reversed; and every one was restored who had lost either honours or fortune by his former adherence to Henry's cause. All the adherents of Edward fled to the continent, or took shelter in monasteries, where they were protected by the ecclesiastical privileges. But Edward's party was not yet destroyed. After an absence of nine months, being seconded by a small body of troops granted him by the Duke of Burgundy, he made a descent at Ravenspur in Yorkshire. At first he met with little success; but his army increasing on his march, he was soon in a condition to appear before the capital, which immediately opened its gates.

The unfortunate Henry was thus again plucked from the throne; and the hopes of Warwick were almost totally blasted by the defection of Clarence, Edward's brother. Nothing now remained but to come to an engagement as soon as possible. Warwick knew his forces to be inferior to those of Edward, but placed great dependence on his own generalship. He therefore advanced to Barnet, within ten miles of London, where he resolved to wait the coming of Edward. The latter soon came up with him, and on the 14th of April 1471, a most obstinate and bloody battle was fought. Edward, according to custom, had ordered no quarter to be given; and obtained the victory through a mistake of a body of Warwick's forces, who fell with fury on their own party instead of the enemy. The earl himself was slain, together with his brother, and 10,000 of his bravest followers.

The queen was just then returned with her son from France, where she had been soliciting supplies. She had scarce time to refresh herself from the fatigues of the voyage, when she received the fatal news of the death of Warwick, and the total destruction of her party. All her resolution was not able to support her under such a terrible disaster. Her grief now for the first time, it is said, manifested itself by her tears; and she immediately took sanctuary in the abbey of Beaulieu in Hampshire. Here she still found some friends willing to assist her. Tudor Earl of Pembroke, Courtney Earl of Devonshire, the Lords Wenlock and St John, with some other men of rank, encouraged her yet to hope for success, and promised to stand by her to the last. On this assurance, she resumed her courage; and advancing through the counties of Devon, Somerset, and Gloucester, increased her army every day. At last, however, she was overtaken by Edward with his victorious army at Tewkesbury, on the banks of the Severne. The Queen's army was totally defeated; the Earl of Devonshire and Lord Wenlock were killed in the field; the Duke of Somerset, and about 20 other persons of distinction, who had taken shelter in a church, were surrounded, dragged out, and immediately beheaded; about 3000 of their party fell in battle, and the army was entirely dispersed. Queen Margaret and her son were taken prisoners, and brought to the king, who asked the prince in an insulting manner, how he dared to invade his dominions? The young prince replied, that he came thither to claim his just inheritance; upon which Edward struck him on the face with his gauntlet. The Dukes of Clarence and Gloucester, Lord Hastings, and Sir Thomas Gray, taking this blow as a signal for farther violence, hurried the prince into the next apartment, and there dispatched him with their

226
Total de-
struction of
the queen's
party.

England. their daggers. Margaret was thrown into the Tower along with her husband Henry, who expired in that confinement a few days after. It was universally believed that he was murdered by the duke of Gloucester, though of this there was no direct evidence. Margaret was ransomed by the king of France for 50,000 crowns, and died a few years after in a most miserable situation.

Edward being now freed from all his enemies, began to inflict punishment on those who had formerly appeared against him. Among the cruelties he committed, that on his brother the duke of Clarence was the most remarkable. The king happening to be one day hunting in the park of Thomas Burdet, a servant of the duke killed a white buck which was a great favourite of the owner. Burdet, vexed at the loss, broke out into a passion, and wished the horns of the deer in the belly of the person who advised the king to that insult. For this exclamation Burdet was tried for his life, and executed at Tyburn. The duke of Clarence exclaimed against the iniquity of this sentence; upon which he was arraigned before the house of peers, found guilty, and condemned to death. The only favour granted him was to have the choice of his death; and his choice was a very singular one, namely, to be drowned in a butt of Malmsey wine; which was accordingly done.—The rest of this reign affords little else than an history of the king's amours. Among his many mistresses, Jane Shore was the most remarkable; (see SHORE.) The king died on the 9th of April 1482, in the 42d year of his age, and 21st of his reign, counting from his first assuming the crown. Besides five daughters, he left two sons; Edward prince of Wales, his successor, then in his 13th year; and Richard duke of York in his 9th.

228
Edward V.

On the death of Edward IV. the kingdom was divided into two new factions. The queen's family, which during the last reign had come into power, was become obnoxious to the old nobility, who considered them as their inferiors. The king had endeavoured to prevent these animosities from coming to a height, by desiring on his death-bed that his brother Richard duke of Gloucester should be entrusted with the regency; and recommended peace and unanimity during the minority of his son. But the king was no sooner dead than the former resentment between these parties broke out with violence; and the duke of Gloucester, who was endued with almost every bad quality, resolved to profit by their contentions. His first step was to get himself declared protector of the realm; and having arrested the earl of Rivers, the king's uncle and guardian, he met young Edward in his way from Ludlow castle, where the late king had resided during the latter part of his reign, and respectfully offered to conduct him to London. Having thus secured the person of the king, he next got possession of his brother's person also. The queen had retired with this child into Westminster abbey; and it was not without extreme regret that she delivered him up at the intercession of the primate and archbishop of York.

229
Duke of Gloucester declared protector.

In a few days after Gloucester had made himself master of the persons of the two princes, he had them confined in the Tower, under pretence of guarding them from danger; and soon after spread reports of their illegitimacy, and by pretended obstacles put off the

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England. young king's coronation. Lord Stanley first began to suspect his designs; and communicated his suspicions to lord Hastings, who had long been firmly attached to the king's family. Lord Hastings would not at first give credit to this surmise; but he very soon had a fatal proof of the truth of what had been communicated to him. On the 13th of June 1483, he was hurried out of the council-room in the Tower by Gloucester's order, and beheaded on a log of timber. The soldiers who carried him off made a bustle as though an attempt had been made to rescue him, and one of them discharged a blow at Lord Stanley's head with a pole-ax; but he happily escaped by shrinking under the table. The same day were executed the Earl Rivers, and some others, who had committed no other crime than being faithful to the young king.

The protector now thought he might with safety lay claim to the throne. He had previously gained over the duke of Buckingham, a nobleman of great influence among the people. He used his utmost endeavours to inspire the people with a notion of the illegitimate birth of the late king, and consequently of his children. Dr Shaw, a popular preacher, was also hired to harangue the people to the same purpose from St Paul's cross. Having expatiated on the incontinence of the queen, and the illegality of the young king's title, he then made a panegyric on the virtues of the protector. "It is the protector (continued he) who carries in his face the image of virtue, and the marks of a true descent. He alone can restore the lost glory and honour of the nation." It was hoped that upon this occasion some of the populace would have cried out, "Long live King Richard!" but the audience remaining silent, the duke of Buckingham undertook in his turn to persuade them. Having expatiated on the calamities of the last reign and the illegitimacy of the present race, he told the people, that he saw only one method of warding off the miseries which threatened the state, which was by electing the protector; but he seemed apprehensive that he would never be prevailed upon to accept a crown accompanied with such difficulty and danger. He next asked his auditors, whether they would have the protector for their king? but was mortified to find that a total silence ensued. The mayor, who was in the secret, willing to relieve him in this embarrassed situation, observed, that the citizens were not accustomed to be harangued by a man of his quality, and would only give an answer to their recorder. This officer, therefore, repeated the duke's speech; but the people continuing still silent, "This is strange obstinacy (cried the duke): we only require of you, in plain terms, to declare, whether or not you will have the duke of Gloucester for your king; as the lords and commons have sufficient power without your concurrence?" At this, some of the meanest apprentices, incited by the servants of the protector and Buckingham, raised a feeble cry of "God save King Richard!" The mob at the door repeated the cry; and throwing up their caps into the air, cried out, "A Richard! A Richard!" After this farce was acted, Buckingham, on the 24th of June 1483, waited on Richard with offers of the crown: but the protector, with hypocritical modesty, at first declined the offer; till being told, that the people, in case of his refusal, must look out for one that would be more compliant,

4 M

he

England. he accepted the government of England and France, with a resolution, as he said, to defend the one and subdue the other.

²³⁰
Richard III.

The first step taken by the new king was to send orders to Sir Robert Brackenbury governor of the Tower, to put the young princes to death. But this he refused; and submissively answered, that he knew not how to embrace his hands in innocent blood. A fit instrument for this purpose, however, was not long wanting. Sir James Tyrrel readily undertook the office; and Brackenbury was ordered to resign the keys to him for one night. Tyrrel choosing three associates, Slater, Deighton, and Forest, came in the night-time to the door of the chamber where the princes were lodged; and sending in the assassins, bid them execute their commission, while he himself staid without. They found the young princes in bed, and fallen into a sound sleep. The assassins smothered them with the bolster and pillows; after which they showed their naked bodies to Tyrrel, who ordered them to be buried at the stair-foot under an heap of stones (c.)

²³¹
Edward V.
and his
brother
murdered.

Richard having thus secured himself on the throne by the most iniquitous methods, attempted to strengthen his interest by foreign alliances, and procuring the favour of the clergy at home by great indulgences; but he found his power threatened from a quarter where he least expected an attack. The duke of Buckingham, who had been so instrumental in raising him to the throne, did not think himself properly rewarded. He made a demand of some confiscated lands in Hereford, to which his family had an ancient claim. Richard either reluctantly complied with his request, or only granted it in part; so that a coolness soon ensued between them, and in a little time Buckingham came to a resolution of dethroning the monarch whom he had just raised. For some time he remained in doubt, whether he should assume the crown himself or set up another. At length he determined on the latter; and resolved to declare for Henry earl of Richmond, who was at that time an exile in Brittany, and was considered as the only surviving branch of the house of Lancaster. He was one of those who had the good fortune to escape the numerous massacres of the former reigns; but as he was a descendant of John of Gaunt by the female line, he was for that reason obnoxious to those in power. He had long lived in exile, and was once delivered over to the ambassadors of Edward IV. who were preparing to carry him to England; when the duke of Brittany, who delivered him, repented of what he had done, and took him from the ambassadors just as they were carrying him on ship-board. His right to the crown by succession was very doubtful: but the cruel behaviour of Richard inclined the people in general greatly to favour him; and, to give an additional strength to his title, a match was projected betwixt him and the princess Elizabeth, the eldest daughter of Edward IV. which, by uniting the two rival families, would put an end to those dissen-

²³²
Buckingham determines to support the claim of the Earl of Richmond to the throne.

sions which had so long filled the kingdom with bloodshed and confusion. Richard, in the mean time, from some reasons which have not been particularized by historians, began to entertain doubts of the fidelity of Buckingham, and determined to cut him off. For this purpose he sent for him to court: but Buckingham, instead of obeying the summons, fled into Wales, where he raised a considerable army, and forthwith set out to the eastward with a design to invade England. Richard hastened to meet him with what forces he could raise; but the march of Buckingham being retarded by a most uncommon inundation of the Severn which lasted 10 days, his troops were so disheartened at this event, that they almost all deserted him. The duke was therefore obliged to fly in distress, and Richard instantly set a price upon his head. Buckingham was now obliged to trust his life in the hands of an old servant of his own, named *Banister*; but this man, tempted by the greatness of the reward, betrayed him to the sheriff of Shropshire, by whom he was seized and conducted to Richard at Salisbury, who caused him to be executed without delay. The earl of Richmond, in the mean time, had set sail from St Maloes with a body of 5000 men: but after his arrival in England, receiving the disagreeable news of Buckingham's misfortune, he set sail again for Bretagne; while Richard, emboldened by the bad success of his enemies, determined to confirm his title to the throne by calling a parliament, which till this time he had not ventured to do. At present, matters were so circumstanced, that the parliament had no other resource than to comply with his desires, and acknowledge his right to the crown. An act was passed confirming the illegitimacy of Edward's children; and an attainder was also confirmed against the earl of Richmond; the duties of tonnage and poundage were granted to the king for life; and his only son Edward, then about 12 years of age, was created Prince of Wales. In return for these concessions, Richard passed several popular laws, particularly against the extorting of money by benevolences, and some others calculated to gain the good will of the opposite party. He paid his court also to the queen-dowager with such assiduity and success, that she left her sanctuary, and put herself and her daughters into his hands. The ambition and cruelty of this man indeed are said to have extinguished every sentiment of natural affection as well as humanity. He had married Anne, the second daughter of the earl of Warwick, and widow of Edward prince of Wales, whom he himself had murdered; but having born him but one son who died about this time, he considered her as an invincible obstacle to the accomplishment of his desires; for which reason it was thought he put an end to her life by poison: and as he knew that the projected match between the earl of Richmond and the Princess Elizabeth could only make the rivalry of the former any way formidable, he resolved to obtain a dispensation.

²³³
He takes up arms, but is abandoned by his army and put to death.

²³⁴
Richmond lands in England, but is obliged to return.

²³⁵
Richard's title confirmed by parliament.

(c) These circumstances are said to have been confessed in the succeeding reign, though the perpetrators escaped punishment. The bodies of the two princes were sought for without any success under the reign of Henry VII. but in the time of Charles V. the bones of two persons answering to their age were found in the spot where they were said to have been buried; which, being supposed to be the remains of these two unfortunate youths, they were buried under a marble monument in Westminster abbey.

England. tion from the pope for marrying her himself. The queen-dowager is even said to have come into this scheme with a view to recover her power; but the princess herself always rejected his addresses with abhorrence. The refusal of the princess occasioned no small perplexity in Richard; and before he could determine on any proper method of accomplishing his purpose, he received news of Richmond's preparations for landing in England. These being soon accomplished, Henry set sail from Harfleur in Normandy, and landed without opposition, on the 17th of August 1485, at Milford haven in Wales. Richard in the mean time, not knowing where the invasion was to take place, had posted himself at Nottingham; which being almost in the centre of the kingdom, was therefore proper for resisting any invader. Sir Rice ap Thomas and Sir Walter Herbert were commissioned by Richard to oppose his rival in Wales; but the former immediately deserted to him, and the latter made but a very feeble resistance. Richard instantly resolved to meet his antagonist, and to risk every thing on the event of a battle. Richmond, though he had not above 6000 men, and the king near double that number, did not decline the combat; being chiefly encouraged by the promises of Lord Stanley to join him with a body of 7000 men, and with whom he hovered at a little distance from the intended field of battle, seemingly indetermined to join either side.

236
Richmond
lands in
England a
second
time.

237
Richard de-
feated and
killed.

The king having commanded his army to form themselves in order of battle, intrusted the van to the duke of Norfolk, while he himself, with the crown on his head, took the command of the main body. Lord Stanley in the mean time posted himself on one flank between the two armies, while his brother Sir William took his station directly opposite. As his intention of either joining the enemy or keeping neutral during the time of the engagement was now far from being doubtful, Richard sent him orders to join the main body; which not being complied with, the tyrant determined to put to death Stanley's son, who had been left with him as a pledge of his father's fidelity. He was persuaded, however, to defer the execution till after the engagement, that Stanley might thereby be induced to delay his purpose in joining the enemy. This, however, did not answer the expectation. Soon after the engagement was begun, Stanley deserted Richard's party, and joining Richmond entirely decided the fortune of the day. The tyrant perceiving his situation to be quite desperate, and seeing his rival at no great distance from him, drove up against him with fury, in hopes that either Henry's death or his own would decide the victory between them. He killed Sir William Brandon the earl's standard-bearer; he dismounted Sir John Cheyney; and was within reach of Richmond, when Sir William Stanley breaking in with his troops, Richard was surrounded and overwhelmed by numbers. His body was found in the field, covered with dead enemies, and besmeared with blood. It was thrown carelessly across a horse, carried to Leicester amidst the shouts of insulting spectators, and interred in the Gray-Friar's church of that place.

The usurper's crown being found on the field of battle, was placed on the head of the conqueror, while the whole army cried out, "Long live king Henry!" Two days after the battle, Henry gave orders to con-

fine Edward Plantagenet earl of Warwick, and son of the unfortunate duke of Clarence; and to release the Princess Elizabeth, who had been confined in the Tower. He then advanced by slow and gradual marches to the city of London, where he was received with the greatest demonstrations of joy. He was crowned King of England on the 30th of October 1485; and, to heighten the splendor on that occasion, he bestowed the rank of knights-banneret on 12 persons, and conferred peerages on three. Jasper earl of Pembroke, his uncle, he created duke of Bedford; Thomas Lord Stanley his father-in-law, earl of Derby; and Edward Courtenay, Earl of Devonshire. At the coronation likewise appeared a new institution, which the king had established for personal security as well as pomp; a band of 50 archers, who were denominated Yeomen of the Guard. But lest the people should take umbrage at this step, as if it implied a diffidence of his subjects, he declared the institution to be perpetual. The ceremony of the coronation was performed by Cardinal Bouchier archbishop of Canterbury.—On the 18th of January 1486, he was married to the Princess Elizabeth; and his marriage was celebrated at London with greater appearance of joy than either his first entry or his coronation had been. Henry remarked, with much displeasure, this general favour borne to the house of York; and the suspicions arising from it, not only disturbed his tranquillity during the whole of his reign, but bred disgust towards his consort herself, and poisoned all his domestic enjoyments.

The reign of Henry VII. was for several years disturbed by plots and insurrections. The people, by a long course of civil war, had become so turbulent and factious, that no governor could rule, nor could any king please them. The violent animosity expressed by this monarch, however, against the house of York, may justly be considered as one of the causes of the extreme proneness to rebellion manifested by his subjects. Instead of endeavouring to conciliate the affections of the opposite party, he always strove to quell them by absolute force and violence. For this purpose he took a journey, soon after his accession, to the north of England, where the Yorkists were very numerous; hoping to get the better of them by his presence. In his journey thither, he received intelligence of an insurrection against him by Viscount Lovel, with Sir Henry Stafford, and Thomas his brother, who had raised an army, and were marching to besiege the city of Worcester, while Lovel approached to assist them with a body of three or four thousand men. They were dispersed, however, by the offer of a general pardon; which induced Lovel to withdraw from his troops, who were thereupon obliged to submit to the king's mercy. The Staffords took sanctuary in the church of Colnham near Abingdon; but as it was found that this church had not the privilege of protecting rebels, they were taken from thence: the elder was executed at Tyburn; but the younger, pleading that he had been misled by his brother, received a pardon.

This success was soon after followed by the birth of a prince; whom Henry named in honour of the celebrated king Arthur, who is said to have been the direct ancestor of the house of Tudor. All this success, however, as well as the general satisfaction which the birth of a prince descended from the houses both of

238
Henry VII.

239
His reign
disturbed
by frequent
rebellions.

240
Lovel and
Stafford's
insurrection
suppressed.

241
Prince Ar-
thur born.

England.
242
Discontents
of the
people.

York and Lancaster necessarily occasioned, were not sufficient to reconcile the hearts of the English to their sovereign. His extreme severity towards the house of York still continued; and unfortunately this was much more beloved by the generality of the nation, than that of Lancaster. Many of the Yorkists had been treated with great cruelty, and deprived of their fortunes under pretence of treason; a general resumption had likewise been made of the grants made by the princes of the house of York. It was likewise universally believed that the queen herself met with harsh treatment, on account of her being one of that unfortunate house; and, from all these circumstances, it was not unreasonably imagined that his enmity was inveterate and invincible. Hence, notwithstanding his politic and vigorous administration, people made no scruple of openly expressing their disapprobation of his conduct and government; and one rebellion seemed to be extinguished only to give birth to another. The king had, at the commencement of his reign, confined the duke of Clarence's son, as has already been mentioned. This unfortunate youth, who had obtained the title of the earl of Warwick, was, through long confinement, entirely unacquainted with the affairs of the world. Simple as he was, however, he was now made use of to disturb the public tranquillity. The queen-dowager was with great reason suspected to be at the bottom of this conspiracy; but not choosing to interfere openly in the matter herself, she employed one Simon a priest of Oxford to execute her purposes. This man cast his eyes upon one Lambert Simnel a baker's son in the same place, a youth of only 15 years of age; but who, from his graceful appearance and accomplishments, seemed proper for personating a man of quality. A report had been spread among the people, that Richard duke of York, second son of Edward IV. had secretly made his escape from the cruelty of his uncle, and lay somewhere concealed in England. Simon had at first instructed his pupil to assume that name, which he found to be much the object of public affection; but hearing afterwards a new report, that Warwick had escaped from the Tower, and observing that this news was attended with no less general satisfaction, he changed the plan of his imposture, and made Simnel personate that unfortunate prince. The pliant youth was therefore directed by his instructor to talk upon many occurrences, as happening to him in the court of Edward. But as the imposture was not calculated to bear a close examination, he was removed to Ireland; and so well had he profited by the lessons given him, that he no sooner presented himself to the earl of Kildare the deputy, claiming his protection as the unfortunate earl of Warwick, than he began to consult with several other noblemen with regard to him. These expressed even a stronger belief in Simnel's story than the deputy himself had done; and in proportion as the story was spread abroad, the more credit it obtained. The impostor was lodged in the castle of Dublin; the inhabitants universally took an oath of allegiance to him, as the true descendant of the Plantagenets; he was crowned with a diadem taken from the statue of the blessed virgin, and proclaimed king by the title of Edward VI.; and the whole kingdom followed the example of the capital.

Such an unexpected event alarmed Henry so much,

that he would have gone over to Ireland on purpose to quell the rebellion in person, had he not been afraid of the machinations of the queen-dowager in his absence. To prevent any thing of this kind, it was resolved to confine her for life in a monastery; under pretence, however, that it was done on account of her having formerly delivered up the princess her daughter to King Richard. The queen murmured against the severity of her treatment; but the king persisted in his resolution, and she remained in confinement till the time of her death, which happened some years after.

The next measure was to show Warwick to the people. He was taken from the Tower, and led thro' the principal streets of London; after which he was conducted in solemn procession to St Paul's, where great numbers were assembled to see him. Still, however, they proceeded in Dublin to honour their pretended monarch; and he was crowned with great solemnity in the presence of the earl of Kildare, the chancellor, and the other officers of state. At last, being furnished by the duchess of Burgundy with a body of 2000 veteran Germans under the command of Martin Swart, a brave and experienced officer, he resolved to invade England. He landed in Lancashire, from whence he marched to York, expecting that the country-people would rise and join him on his march. But in this he was deceived: the people were unwilling to join a body of foreigners; and were besides kept in awe by the great reputation of Henry. Lord Lincoln, therefore, who commanded the rebel army, determined to bring the matter to a speedy issue. Accordingly he met the royal army at Stoke in the county of Nottingham. An obstinate engagement ensued, but at length King Henry obtained a complete victory. Lord Lincoln, with 4000 private men, perished in the battle; and Simnel with his tutor Simon were taken prisoners. Simon being a priest, could not be tried by the civil power, and was only committed to close confinement. Simnel was pardoned, and made a scullion in the king's kitchen, whence he was afterwards advanced to the rank of falconer, in which employment he died.

Henry being now freed from all danger from that quarter, determined to take ample vengeance on his enemies. For this purpose he took a journey into the north; but though he found many delinquents, his natural avarice prompted him to exact heavy fines from them rather than to put them to death. His proceedings, however, were extremely arbitrary; the criminals being tried, not by the ordinary judges, but either by commissioners appointed for the occasion, or suffering punishment by sentence of a court-martial. Having thus fully established his authority as far as it could be done by suppressing and punishing domestic enemies, he next determined to recommend himself to his subjects by a report of his military disposition; hoping, that by undertaking, or pretending to undertake, some martial enterprises, he would thus gain the favour of a people naturally turbulent, and unaccustomed to live long at peace with their neighbours. He certainly had not, however, the least intention of prosecuting foreign conquests; though, to please the people, he frequently gave out that he designed to invade France, and lay waste the whole country, rather than not recover his continental possessions. Under these pretences, particularly that of assisting the Bretons whom the

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The queen-
dowager
confined.

243
Imposture
of Robert
Simnel.

245
Henry pu-
nishes his
enemies.

246
Pretends a
desire of at-
chieving
martial ex-
ploits.

king.

England. king of France had lately subdued, and who had applied to him for relief, he persuaded his parliament to grant him a considerable supply; but this involved him in some difficulties. The counties of Durham and York, who had always been discontented with Henry's government, and still farther provoked by the oppressions under which they had laboured after the extinction of Simnel's rebellion, opposed the commissioners sent by the king to levy the tax. The latter applied to the earl of Northumberland, requesting his advice and assistance in the execution of their office; but instead of being able to enforce the levying of the tax, he himself was attacked and put to death by the insurgents. This act of violence committed by themselves, seemed to render the insurgents desperate, so that without more ado they prepared to resist the royal power, under the conduct of one Sir John Egremont; but in this ill-conducted and precipitate scheme they met with no success. Henry instantly levied a considerable force, which he committed to the charge of the earl of Surrey; by whom the rebels were quickly defeated, and one of their leaders taken prisoner. Sir John Egremont fled to the dukes of Burgundy, who afforded him protection.

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Obtains a
subsidy on
pretence of
assisting the
inhabitants
of Bretagne

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An insur-
rection
suppressed.

249
Henry
makes a
feigned in-
vasion of
France.

250
Obtains a
sum of mo-
ney and an-
nual pen-
sion.

251
Imposture
of Perkin
Warbeck.

Thus Henry obtained the subsidy which he had solicited under pretence of invading France, though he would willingly have avoided any expence in preparations for that purpose in order to keep the money in his possession; but as the Bretons had applied to him for assistance, and their distresses became every day more urgent, he found himself obliged to attempt something. With this view he set sail for Calais with an army of 25,000 foot and 1600 horse, of which he gave the command to the duke of Bedford and the earl of Oxford: but notwithstanding this apparent hostile disposition, negotiations for peace had been secretly begun, and commissioners even appointed to consider of the terms, three months before King Henry set out for the continent. As the love of money was the prevailing passion of the English monarch, and the possession of Bretagne was a great object to France, an accommodation soon took place betwixt the contending parties. The king of France engaged to pay Henry near L.200,000 as a reimbursement for the expences of his expedition, and stipulated at the same time to pay him and his heirs an annual pension of 25,000 crowns more.

Thus the authority of Henry seemed to be so firmly established, as to leave no reason to dread any rival in time to come; but still he found himself mistaken. The dukes of Burgundy, resenting the depression of her family, and exasperated by her frequent miscarriages in the attempts already made, resolved to make a final effort against Henry, whom she greatly hated. For this purpose, she propagated a report that her nephew Richard Plantagenet, duke of York, had escaped from the Tower where his elder brother was murdered, and that he still lay somewhere concealed. Finding this report eagerly received, she soon found a young man who assumed both his name and character. The person chosen to act this part was the son of one Osbeck, or Warbeck, a converted Jew, who had been in England during the reign of Edward IV. His name was *Peter*; but it had been corrupted after the Flemish manner into *Peterkin*, or *Perkin*. It was by some

believed, that Edward, among his other amorous adventures, had a secret correspondence with Warbeck's wife, which might account for the great similarity of features between Perkin and that monarch. The dukes of Burgundy found this youth entirely suited to her purposes. The lessons she gave him were easily learned and strongly retained. His graceful air, his courtly address, his easy manners, and elegant conversation, were capable of imposing upon all but those who were privy to the imposture. The kingdom of Ireland was pitched upon for Perkin's first appearance, as it had been before for that of Simnel. He landed at Cork; and immediately assuming the name of *Richard Plantagenet*, was followed by great numbers of credulous people. He wrote letters to the earls of Desmond and Kildare, inviting them to join his party; he dispersed every where the strange intelligence of his escape from his uncle Richard's cruelty; and his story meeting with general credit, he soon became an object of the public favour. All those who were disgusted with the king, prepared to join Perkin; but particularly those who formerly were Henry's favourites, and had contributed to place him on the throne. These, thinking their services had not been sufficiently repaid, now became heads of the conspiracy. Their attempts, however, were all frustrated by the vigilance of the king, and most of the conspirators of any note were publicly executed.

Perkin finding it was in vain to attempt any thing in England, went to the court of James IV. of Scotland. Here he was received with great cordiality; and James carried his confidence in him so far, that he even gave him in marriage lady Catherine Gordon, daughter to the earl of Huntley, and a near kinswoman of his own. But when he attempted to set him on the throne of England, he found himself totally disappointed; and on the conclusion of peace between the two kingdoms, Perkin was obliged to leave Scotland. From thence he went to Flanders; and meeting with but a cool reception there, he resolved to try the affections of the people of Cornwall, who had lately risen against the king on account of a new tax which had been levied upon them. On his first appearance, Perkin was joined by about 3000 of these people, with which force he laid siege to Exeter. Henry, however, having marched against him with a considerable army, Perkin's heart failed him, though his followers now amounted to 7000; and he took shelter in a monastery. His wife fell into the conqueror's hands; who placed her in a respectable situation near the queen's person, with a suitable pension, which she enjoyed till her death. Perkin being persuaded to deliver himself into the king's hand, was compelled to sign a confession of his former life and conduct; but this was so defective and contradictory, that very little regard was paid to it. His life was granted him; though he was still detained in custody, and keepers were appointed to watch his conduct. From these, however, he broke loose; and flying to the sanctuary of Shyne, put himself into the prior's hands. He was once more prevailed upon to trust himself in the king's hands, and was committed to the Tower; but having here entered into a correspondence with the earl of Warwick in order to make their escape, both of them were condemned and executed.

To Henry VII. in a great measure is owing the
pres-

England.
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English na-
tion civi-
lized by
Henry.

present civilized state of the English nation. He had all along two points principally in view; the one to depress the nobility and clergy, and the other to exalt and humanize the populace. In the feudal times every nobleman was possessed of a certain number of vassals, over whom he had, by various methods, acquired an almost absolute power; and, therefore, upon every slight disgust, he was able to influence them to join him in his revolt or disobedience. Henry considered, that the giving of his barons a power to sell their estates, which were before unalienable, must greatly weaken their interest. This liberty therefore he gave them; and it proved highly pleasing to the commons, nor was it disagreeable to the nobles themselves. His next scheme was to prevent their giving liveries to many hundreds of their dependents, who were thus kept like the soldiers of a standing army to be ready at the command of their lord. By an act passed in this reign, none but menial servants were allowed to wear a livery; and this law was enforced under severe penalties.

With the clergy, Henry was not so successful. The number of criminals of all kinds who found protection in monasteries and other places appointed for religious worship, seemed to indicate little less than an absolute toleration of all kinds of vice. Henry used all his interest with the pope to get these sanctuaries abolished, but to no purpose. All that he could procure was, that if thieves, murderers, or robbers, registered as sanctuary men, should fall out and commit fresh offences, and retreat again, in such cases they might be taken out of the sanctuary and delivered up to justice.

In 1500, the king's eldest son Arthur was married to the Infanta Catharine of Spain, which marriage had been projected and negotiated seven years. But the prince dying in a few months after marriage, the princess was obliged to marry his younger brother Henry, who was created Prince of Wales in his room. Henry himself made all the opposition which a youth of 12 years of age is capable of; but as the king persisted in his resolution, the marriage was by the pope's dispensation shortly after solemnized.—In the latter part of this king's reign, his economy, which had always been exact, degenerated into avarice, and he oppressed the people in a very arbitrary manner. He had two ministers, Empson and Dudley, perfectly qualified to second his avaricious intentions. They were both lawyers, and usually committed to prison by indictment such persons as they intended to oppress; from whence they seldom got free but by paying heavy fines, which were called mitigations and compositions: but by degrees the very forms of law were omitted; and they determined in a summary way upon the properties of the subjects, and confiscated their effects to the royal treasury.—Henry VII. died of the gout in his stomach, in the year 1509, having lived 52 years, and reigned 23; and was succeeded by his son Henry VIII. In Henry VII.'s reign was built a large ship of war called the *Great Harry*, which cost L. 14,000. This was, properly speaking, the first ship in the English navy. Before this period, when the king wanted a fleet, he had no other expedient than to hire ships from the merchants.

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Henry VIII.

Henry VIII. ascended the throne when he was a-

bout 18 years of age, and had almost every advantage which a prince can have on his accession. He had a well-stored treasury, an undisputed title, and was at peace with all the powers in Europe. Commerce and arts had been some time introduced into England, where they met with a favourable reception. The young prince himself was beautiful in his person, expert in all polite exercises, open and liberal in his air, and loved by all his subjects. The old king, who was himself a scholar, had instructed him in all the learning of the times, so that he was an adept in school-divinity before the age of 18.

All these advantages, however, seemed to have been lost upon the new king. Being destitute of a good heart and solid understanding, he proved a tyrant. Being always actuated not by reason but the passion which happened to be uppermost in his mind, he behaved in the most absurd and contradictory manner; and however fortunate some of his measures proved at last, it is impossible that either his motives, or the means he took for the accomplishment of his purposes, can be approved of by any good man.

One of Henry's first actions in his royal capacity was to punish Empson and Dudley, who were obnoxious to the populace on account of their having been the instruments of the late king's rapacity. As they could not be impeached merely on account of their having strictly executed the will of the king, they were accused of having entered into a treasonable conspiracy, and of having designed to seize by force the administration of government; and though nothing could be more improbable than such a charge, the general prejudice against them was so great, that they were both condemned and executed.

In 1510, the king entered into a league with pope Julius II. and Ferdinand king of Spain, against Louis XII. of France. In this alliance Henry was the only disinterested person. He expected nothing besides the glory which he hoped would attend his arms, and the title of *Most Christian King*, which the pope assured him would soon be taken from the king of France to be conferred upon him. The pope was desirous of wresting from Louis some valuable provinces which he possessed in Italy, and Ferdinand was desirous of sharing in the spoil. Henry summoned his parliament; who very readily granted him supplies, as he gave out that his design was to conquer the kingdom of France, and annex it to the crown of England. It was in vain that one of his old prudent counsellors objected, that conquests on the continent would only drain the kingdom without enriching it; and that England, from its situation, was not fitted to enjoy extensive empire. The young king, deaf to all remonstrances, and hurried away by his military ardour, resolved immediately to begin the war. But after several attempts, which were rendered unsuccessful only by the mismanagement of those who conducted them, a peace was concluded with France on the 7th of August 1514.

Henry's arms were attended with more success in Scotland; where King James IV. with the greatest part of the Scot's nobility, and 10,000 of the common people, were cut off in the battle of Flowden*. Henry in the mean time, puffed up with his imaginary successes against France, and his real ones against Scotland, * See Scot-land.

England.

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Cardinal
Wolsey
minister.* See Wol-
sey.255
Arbitrary
behaviour
of the king.

land, continued to lavish his treasures by expensive pleasures and no less expensive preparations for war. The old ministers who had been appointed by his father to direct him, were now disregarded; and the king's confidence was entirely placed in Thomas afterwards Cardinal Wolsey, who seconded him in all his favourite pursuits, and who, being the son of a private gentleman at Ipswich, had gradually raised himself to the first employments of the state*. He doth not seem to have had many bad qualities besides his excessive pride, which disgusted all the nobility; but the great share he possessed in the favour of such an absolute prince as Henry VIII. put him quite out of the reach of his enemies.

The king having soon exhausted all the treasures left him by his father, as well as the supplies which he could by fair means obtain from his parliament, applied to Wolsey for new methods of replenishing his coffers. The minister's first scheme was to get a large sum from the people under the title of *benevolence*; though no title could be more improperly applied, as it was not granted without the greatest murmurings and complaints. Wolsey even met with opposition in the levying of it. In the first place, having exacted a considerable sum from the clergy, he next applied himself to the house of commons; but they only granted him half the sum he demanded. The minister at first was highly offended, and desired to be heard in the house; but they replied, that none could be permitted to sit and argue there except such as were members. Soon after, the king having occasion for new supplies, by Wolsey's advice attempted to procure them by his prerogative alone, without consulting his parliament. He issued out commissions to all the counties of England for levying four shillings in the pound from the clergy, and three shillings and fourpence from the laity. This stretch of royal power was soon opposed by the people, and a general insurrection seemed ready to ensue. Henry endeavoured to pacify them by circular letters; in which he declared, that what he demanded was only by way of benevolence. The city of London, however, still hesitated on the demand; and in some parts of the country insurrections were actually begun. These were happily suppressed by the duke of Suffolk; but the cardinal lost somewhat of the king's favour on account of the improper advice he had given him. To reinstate himself in his good graces, Wolsey made the king a present of a noble palace called *York-place*, at Westminster, assuring him that from the first he had intended it for the king's use. In order to have a pretence for amassing more wealth, Wolsey next undertook to found two new colleges at Oxford; and for this purpose he received every day fresh grants from the pope and the king. The former imprudently gave him liberty to suppress some monasteries, and make use of their revenues for the erection of his new colleges; but this was a fatal precedent for the pontiff's interests, as it taught the king to seize on the monastic revenues whenever he stood in need of money.

For a considerable time Wolsey continued to enjoy the king's favour in an extreme degree; and as no monarch was ever more despotic than Henry VIII. no minister was ever more powerful than Wolsey. This extraordinary elevation served only to render his fall the more conspicuous, and himself the more miserable,

when it took place; and what was worse, he had long foreseen, from what he knew of the king's capricious and obstinate temper, that it certainly would happen one time or other. The cause of his final overthrow was the desire King Henry began to entertain of having his Queen Catherine divorced. The doctrines of the reformation, propagated by Luther in 1517, had gained considerable ground in England, and many professed a belief in them, notwithstanding the severe persecution which had been carried on against heretics during some of the preceding reigns. The clergy had become so exceedingly corrupt, and were immersed in such monstrous ignorance, that they were universally hated even by their own party, while no regard at all was paid to their decisions, or rather they were looked upon with the utmost abhorrence, by the reformers. Even the papal authority, though still very great, had, in no greater a space of time than ten years (viz. from 1517, when Luther first began to attack it, to the present year 1527), declined very sensibly. The marriage of King Henry therefore being in itself looked upon by all parties as illegal in itself, and only sanctified by a dispensation from the pope, had been frequently objected to on different occasions. We are informed by some authors, that when Henry VII. betrothed his son, at that time only 12 years of age, he evidently showed an intention of taking afterwards a proper opportunity to annul the contract; and that he ordered Prince Henry, as soon as he should come of age, to enter a protestation against the marriage; charging him on his death-bed not to finish an alliance so unusual, and liable to such insuperable objections. Some members of the privy council, particularly Warham the primate, afterwards declared against the completion of the marriage; and even after it was completed, some incidents which in a short time took place were sufficient to make him sensible of the general sentiments of the public on that subject. The states of Castile had opposed a marriage betwixt the emperor Charles and the English princess Mary, Henry's daughter, urging among other things the illegitimacy of her birth. The same objection afterwards occurred on opening a negotiation with France for a marriage with the duke of Orleans.

If these accounts are to be depended upon as authentic, we can scarce conceive it possible but Henry himself must have been somewhat staggered by them; though it is by no means probable that they were his only motives. The queen was six years older than the king, her personal charms were decayed, and his affection lessened in proportion. All her children had died in infancy except one daughter, the Princess Mary above mentioned; and Henry was, or pretended to be, greatly struck with this, as it seemed something like the curse of being childless, pronounced in the Mo-
saic law against some evil-doers. Another point of the utmost importance was the succession to the crown, which any question concerning the legitimacy of the king's marriage would involve in confusion. It was also supposed, with great reason, that should any obstacles of this kind occur, the king of Scotland would step in as the next heir, and advance his pretensions to the crown of England. But above all, it is probable that he was influenced by the love he had now contracted for Anne Boleyn, who had lately

England.

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Cause of
Wolsey's
disgrace.257
Scruples
concerning
the legality
of Henry's
marriage.258
Other rea-
sons for
Henry's de-
sire of a di-
vorce.259
His love for
Anne Bo-
leyn.

lately.

England. lately been appointed maid of honour to the queen. In this station Henry had frequent opportunities of seeing her, and soon became deeply enamoured; and finding that his passion could not be gratified but by a marriage, it is not to be doubted that he was thus obstinately set upon the divorce; for which purpose he sent his secretary to Rome to obtain from Clement a bull for dissolving his marriage with Catharine. That he might not seem to entertain any doubt of the pope's prerogative, he insisted only on some grounds of nullity in the bull granted by his predecessor Julius for the accomplishment of the marriage. In the preamble to this bull, it had been said, that it was granted only upon the solicitation of Henry himself; though it was known that he was then a youth under 12 years of age: it was likewise asserted, that the bull was necessary for maintaining the peace between the two crowns; though otherwise it is certain that there was no appearance of a quarrel betwixt them. These false premises seemed to afford a very good pretence for dissolving it; but, as matters then stood, the pope was involved in the utmost perplexity. Queen Catharine was aunt to the emperor, who had lately made Clement himself a prisoner, and whose resentment he still dreaded: and besides, he could not with any degree of prudence declare the bull of the former pope illicit, as this would give a mortal blow to the doctrine of papal infallibility. On the other hand, Henry was his protector and friend; the dominions of England were the chief resource from whence his finances were supplied; and the King of France, some time before, had got a bull of divorce in circumstances nearly similar. In this exigence he thought the wisest method would be to spin out the affair by negotiation; and in the mean time he sent over a commission to Wolsey, in conjunction with the archbishop of Canterbury or any other English prelate, to examine the validity of the king's marriage and of the former dispensation; granting them also a provisional dispensation for the king's marriage with any other person.

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Sends to
Rome to
obtain a di-
vorce.

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Extreme
perplexity
of the
Pope.

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Henry's
controversy
with him.

The pope's message was laid before the council in England: but they considered, that an advice given by the pope in this secret manner might very easily be disavowed in public; and that a clandestine marriage would totally invalidate the legitimacy of any issue the king might have by such a match. In consequence of this, fresh messengers were dispatched to Rome, and evasive answers returned; the pope never imagining that Henry's passion would hold out during the tedious course of an ecclesiastical controversy. But in this he was mistaken. The king of England had been taught to dispute as well as the pope, and valued himself not a little in his knowledge on theology: and to his arguments he added threats; telling him, that the English were but too well disposed to withdraw from the holy see; and that if he continued uncomplying, the whole country would readily follow the example of their monarch, who should always deny obedience to a pontiff that had treated him with such falsehood and duplicity. The king even proposed to his holiness, whether, if he were not permitted to divorce his present queen, he might not have a dispensation for having two wives at once?

The pope, perceiving the king's eagerness, at last sent Cardinal Campeggio his legate to London; who,
N^o 117.

with Wolsey, opened a court for trying the legitimacy of the king's marriage with Catharine, and cited the king and queen to appear before them. The trial commenced the 31st of May 1529; and both parties presented themselves. The king answered to his name when called: but the queen, instead of answering to hers, rose from her seat, and throwing herself at the king's feet, made a very pathetic harangue; which her dignity, her virtue, and misfortunes, rendered still more affecting. She told her husband, "That she was a stranger in his dominions, without protection, without counsel, and without assistance; exposed to all the injustice which her enemies were pleased to impose upon her: That she had quitted her native country, without any other resource than her connections with him and his family; and that, instead of suffering thence any violence or iniquity, she had been assured of having in them a safeguard against every misfortune: That she had been his wife during 20 years; and would here appeal to himself, whether her affectionate submission to his will had not merited other treatment than to be thus, after so long a time, thrown from him with indignity: That she was conscious,—he himself was assured,—that her virgin honour was yet unstained when he received her into his bed; and that her connections with his brother had been carried no farther than the mere ceremony of marriage: That their parents, the kings of England and Spain, were esteemed the wisest princes of their time, and had undoubtedly acted by the best advice when they formed the agreement for that marriage, which was now represented as so criminal and unnatural: And that she acquiesced in their judgment, and would not submit her cause to be tried by a court whose dependence on her enemies was too visible ever to allow her any hopes of obtaining from them an equitable or impartial decision." Having spoken these words, the queen rose, and, making the king a low reverence, left the court; nor would she ever again appear in it. The legate having again summoned the queen to appear before them, on her refusal, declared her contumacious, and the trial proceeded in her absence. But when the business seemed to be nearly decided, Campeggio, on some very frivolous pretences, prorogued the court, and at last transferred the cause before the see of Rome.

All this time Cardinal Wolsey seemed to be in the same dilemma with the pope, and indeed much worse; as he could not boast of the same independence which his holiness possessed. On the one hand, he was very solicitous to gratify the king his master, who had distinguished him by so many and extraordinary marks of favour; on the other, he feared to offend the pope, whose servant he more immediately was, and who likewise had power to punish his disobedience. He had long known that this affair was certainly to end in his ruin; and by attempting to please all parties, he fell under the displeasure of every one; so that he was at last left without a single friend in the world. The king was displeased on account of his not entering into his cause with the warmth he thought he had reason to expect; Anne Boleyn imputed to him the disappointment of her hopes; while even queen Catharine and her friends expressed the greatest indignation against him on account of the part he had openly taken in the affair of her divorce. In this miserable situation the king

England.
Trial of the
king and
queen be-
fore the
pope's le-
gate.

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Embarrass-
ment of
Cardinal
Wolsey.

England.
265
Is disgraced
and per-
secuted.

king sent him a message by the dukes of Norfolk and Suffolk, demanding the great seal: the cardinal refused to deliver it without a more express warrant; upon which Henry wrote him a letter, and on receipt of this it was instantly given up. The seal was bestowed on Sir Thomas More; a man who, besides elegant literary talents, was possessed of the highest capacity, integrity, and virtue. Wolsey was next commanded to depart from York-place palace which he had built in London; and which, though it belonged to the see of York, was now seized by the king, and afterwards became the residence of the British sovereigns, under the name of *Whitehall*. All his furniture and plate, the richness of which seemed rather proper for a monarch than a subject, was seized for the king's use. He was then commanded to retire to Elsher, a country-seat which he possessed near Hampton court, and there to wait the king's pleasure. One disgrace followed another; and his fall was at length completed by a summons to London to answer a charge of high-treason. This summons he at first refused to answer, as being a cardinal. However, being at length persuaded, he set out on his journey; but was taken ill, and died by the way. See the article *WOLSEY*.

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All the
universities
of Europe
consulted
about the
legality of
the king's
marriage.
* See *Cran-*
mer.

After the death of Wolsey, the king, by the advice of Cranmer*, had the legality of his marriage debated in all the universities of Europe; and the votes of these were obtained in his favour by dint of money. The disbursements made on the occasion have even been preferred to this day. To a subdeacon he gave a crown, to a deacon two crowns, and so to the rest in proportion to the importance of their station or opinion.—Being thus fortified by the opinions of the universities, and even of the Jewish rabbies (for them also he had consulted), Henry began to think he might safely oppose the pope himself. He began by reviving in parliament an old law against the clergy, by which all those who had submitted to the authority of the pope's legate were condemned to severe penalties. The clergy, to conciliate the king's favour, were obliged to pay a fine of 118,000 pounds. A confession was likewise extorted from them, that the king, and not the pope, was the supreme head of the church and clergy of England. An act was soon after passed against levying the first-fruits, or a year's rent of all the bishoprics that fell vacant. After this the king privately married his beloved Anne Boleyn; and she proving with child soon after marriage, he publicly owned her for his wife, and passed with her through London, with a greater magnificence than had ever been known before. The streets were strewed with flowers, the walls of the houses hung with tapestry, and an universal joy seemed to be diffused among the people. The unfortunate queen Catharine, perceiving all further opposition to be vain, retired to Amphyll near Dunstable, where she continued the rest of her days in privacy and peace. Her marriage with Henry was at last declared invalid, but not till after the latter had been married to Anne Boleyn, though this declaration ought undoubtedly to have preceded it. See *BOLEYN*.

The pope was no sooner informed of these proceedings, than he passed a sentence, declaring Catharine to be the king's only lawful wife; requiring him to take her again, and denouncing his censures against him in case of a refusal. Henry, on the other hand, knowing

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that his subjects were entirely at his command, resolved to separate totally from the church of Rome. In the year 1534, he was declared head of the church by parliament; the authority of the pope was completely abolished in England; all tributes formerly paid to the holy see were declared illegal; and the king was entrusted with the collation to all ecclesiastical benefices. The nation came into the king's measures with joy, and took an oath called the *oath of supremacy*: all the credit which the popes had maintained over England for ages, was now overthrown at once; and none seemed to repine at the change, except those who were immediately interested by their dependence on Rome.

But though the king thus separated from the church of Rome, he by no means adhered to the doctrines of Luther which had been lately published. He had written a book against this celebrated reformer, which the pope pretended greatly to admire; and honoured King Henry, on its account, with the title of "Defender of the faith." This character he seemed to be determined to maintain, and therefore persecuted the reformers most violently. Many were burnt for denying the popish doctrines, and some also were executed for maintaining the supremacy of the pope. The courtiers knew not which side to take, as both the new and old religions were equally persecuted; and as both parties equally courted the favour of the king, he was by that means enabled to assume an absolute authority over the nation. As the monks had all along shown the greatest resistance to Henry's ecclesiastical character, he resolved at once to deprive them of the power of injuring him. He accordingly empowered Cromwell, secretary of state, to send commissioners into the several counties of England to inspect the monasteries; and to report, with rigorous exactness, the conduct and deportment of such as were found there. This employment was readily undertaken by some creatures of the court, whose names were Layton, London, Price, Gage, Petre, and Belafis. They are said to have discovered monstrous disorders in many of the religious houses; whole convents of women abandoned to all manner of lewdness; friars accomplices in their crimes; pious frauds every where committed, to increase the devotion and liberality of the people; and cruel and inveterate factions maintained between the inhabitants. Thus a general horror was excited against these communities; and therefore the king, in 1536, suppressed the lesser monasteries, amounting to 376 in number. Their revenues, computed at 32,000 pounds a-year, were confiscated to the king's use; besides their plate and other goods, computed at 100,000 pounds more. In 1538, the greater monasteries also were demolished. The better to reconcile the people to this great innovation, stories were published, perhaps with aggravations, of the detestable lives which the friars led in their convents. The reliques also, and other objects of superstitious veneration, were now brought forth, and became objects of derision to the reformers. A great number of these are enumerated by Protestant writers; such as the parings of St Edmund's toes; some of the coals that roasted St Laurence; the girdle of the Virgin Mary, shown in no fewer than eleven different places; two or three heads of St Ursula; the felt of St Thomas of Lancaster, an infallible cure for the headach; part of St Thomas of Canterbury's shirt,

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England. much revered among big-bellied women; some reliques, an excellent preservative against rain, others against weeds in corn; &c. Some impostures, however, were discovered, which displayed a little more ingenuity in the contrivance. At Hales in the county of Gloucester had been shown, during several ages, the blood of Christ brought from Jerusalem. The veneration for this precious relique may easily be imagined; but it was attended with a most remarkable circumstance not observed in any other reliques. The sacred blood was not visible to any one in mortal sin, even when set before him; nor could it be discovered till he had performed good works sufficient for his absolution. At the dissolution of the monastery, the whole contrivance was discovered. Two of the monks who were let into the secret, had taken the blood of a duck, which they renewed every week: they put it into a phial, one side of which was thin and transparent crystal, the other thick and opaque. When any rich pilgrim arrived, they were sure to show him the dark side, till masses and offerings had expiated his offences; after which they made him happy, by turning the phial. — A miraculous crucifix had been kept at Boxely in Kent, and bore the appellation of the *rood of grace*. The lips, eyes, and head of the image, moved on the approach of its votaries. Helsey bishop of Rochester broke the crucifix at St Paul's cross, and showed to all the people the springs and wheels by which it had been secretly moved. A great wooden idol, called *Darvel Gatherin*, was also brought to London and cut in pieces: and, by a cruel refinement of vengeance, it was employed as fuel to burn Friar Forest; who was punished for denying the king's supremacy, and for some pretended heresies. A finger of St Andrew, covered with a thin plate of silver, had been pawned for a debt of 40 pounds; but as the king's commissioners refused to release the pawn, people made themselves very merry with the poor creditor on account of his security. On this occasion also was demolished the noted shrine of Thomas a Becket, commonly called *St Thomas of Canterbury* *. The riches of it were inconceivable when broken down; the gold with which it was adorned filled two large chests that eight strong men could scarce carry out of the church. The king, on the whole, suppressed 645 monasteries, of which 28 had abbots who enjoyed a seat in parliament. Ninety colleges were demolished in several counties; 2374 chantries and free chapels, and 110 hospitals. The whole revenue of these establishments amounted to 161,100 pounds.

* See
Becket.

It is easy to imagine the indignation which such an uninterrupted course of sacrilege and violence would occasion at Rome. In 1535, the king had executed Bishop Fisher, who was created a cardinal while in prison, and Sir Thomas More, for denying or speaking ambiguously about his supremacy. When this was reported in Italy, numerous libels were published all over the country, comparing the king of England to Nero, Domitian, Caligula, and the most wicked tyrants of antiquity. Clement VII. died about six months after he had threatened the king with a sentence of excommunication; and Paul III. who succeeded him in the Papal throne, entertained some hopes of an accommodation. But Henry was so much accustomed to domineering, that the quarrel was soon rendered totally

incurable. The execution of Fisher was reckoned such a capital injury, that at last the pope passed all his censures against the king, citing him and all his adherents to appear in Rome within 90 days, in order to answer for their crimes. If they failed, he excommunicated them; deprived the king of his realm; subjected the kingdom to an interdict; declared his issue by Anne Boleyn illegitimate; dissolved all leagues which any Catholic princes had made with him; gave his kingdom to any invader; commanded the nobility to take up arms against him; freed his subjects from all oaths of allegiance; cut off their commerce with foreign states; and declared it lawful for any one to seize them, to make slaves of their persons, and to convert their effects to his own use. But though these censures were then passed, they were not openly denounced. The pope delayed the publication till he should find an agreement with England totally desperate, and till the emperor, who was then hard pressed by the Turks and the Protestant princes of Germany, should be in a condition to carry the sentence into execution. But in 1538, when news arrived at Rome that Henry had proceeded with the monasteries as above related, the pope was at last provoked to publish the censures against him. Libels were again dispersed, in which he was anew compared to the most furious persecutors of antiquity, and the preference was now given on their side. Henry, it was said, had declared war with the dead, whom the Pagans themselves respected; was at open enmity with heaven; and had engaged in professed hostility with all the saints and angels. Above all, he was reproached with his resemblance to the emperor Julian, whom (it was said) he imitated in his apostacy and learning, though he fell short of him in his morals. But these terrible fulminations had now lost their effect. Henry had long ago denied the supremacy of the Pope, and therefore had appealed from him to a general council; but now, when a general council was summoned at Mantua, he refused to be subject to it, because it was called by the pope, and lay entirely under subjection to that spiritual usurper. He engaged his clergy to make a declaration to the like purpose, and prescribed to them many other alterations with regard to their ancient tenets and practices. It was expected that the spirit of opposition to the church of Rome would have at last made him fall in with the doctrines of the reformed; but though he had been gradually changing the theological system in which he was educated, ever since he came to the years of maturity, he was equally positive and dogmatical in the few articles he retained, as tho' the whole fabric had continued entire and unshaken: and though he stood alone in his opinion, the flattery of courtiers had so much inflamed his tyrannical arrogance, that he thought himself intitled to regulate by his own particular standard, the religious faith of the whole nation. The point on which he chiefly rested his orthodoxy was the most absurd in the whole Popish doctrine, namely, that of transubstantiation. All departure from this he held to be a damnable error; and nothing, he thought, could be more honourable for him, than, while he broke off all connections with the Roman pontiff, to maintain, in this essential article, the purity of the Catholic faith.

In 1539, a parliament was called, which met on the 28th day of April. The chancellor opened this

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England parliament by informing the House of Lords, that it was his majesty's earnest desire to extirpate from his kingdom all diversity of opinions with regard to religion; and as this enterprise was, he owned, difficult and important, he desired them to choose a committee from among themselves, who might frame certain articles, and communicate them afterwards to parliament. The lords named the vicar-general Cromwell, now created a peer, the archbishops of Canterbury and York, the bishops of Durham, Carlisle, Worcester, Bath and Wells, Bangor and Ely. This small committee itself was agitated with such diversity of opinions, that it could come to no conclusion. The Duke of Norfolk then moved, that since there was no hope of having a report from the committee, the articles of faith proposed to be established should be reduced to six, and a new committee be appointed to frame an act with regard to them. As this peer was understood to speak the king's mind, his motion was immediately complied with; and after a short prorogation, the bill of the six articles, or the *bloody bill*, as the Protestants justly termed it, was introduced; and having passed the two houses, received the king's assent. By this law the doctrine of the real presence was established; the communion in one kind; the perpetual obligation of vows of chastity; the utility of private masses; the celibacy of the clergy; and the necessity of auricular confession. The denial of the real presence subjected the person to death by fire, and to the same forfeiture as in cases of treason; and admitted not the privilege of abjuring: an unheard-of cruelty, unknown even to the inquisition itself. The denial of any of the other articles, even though recanted, was punishable by the forfeiture of goods and chattels, and imprisonment during the king's pleasure: an obstinate adherence to error, or a relapse, was adjudged to be felony, and punishable by death. The marriage of priests was subjected to the same punishment. Their commerce with women, was, for the first offence, forfeiture and imprisonment; and for the second, death. Abstaining from confession, and from receiving the eucharist at the accustomed times, subjected the person to fine, and to imprisonment during the king's pleasure; and if the criminal persevered after conviction, he was punishable by death and forfeiture, as in cases of felony. Commissioners were to be appointed by the king for inquiring into these heresies and irregular practices, and the criminals were to be tried by a jury.

The parliament having thus surrendered their ecclesiastical privileges, next proceeded to surrender their civil ones also. They gave to the king's proclamations the same force as to statutes enacted by parliament, and thus by one blow made a total subversion of the English constitution; and to render the matter worse, if possible, they framed this law as if it were only declaratory, and intended to explain the natural extent of the royal authority.—Notwithstanding this, however, they afterwards pretended to make some limitations in the regal power; and they enacted, that no proclamation should deprive any person of his lawful possessions, liberties, inheritances, &c. nor yet infringe any common law or laudable custom of the realm.

As soon as the act of the six articles had passed, the Catholics were extremely vigilant to inform against of-

fenders; and, in a short time, no fewer than 500 persons were thrown into prison. But some of the chief officers of state remonstrating against the cruelty of punishing such a number of delinquents, they were all of them set at liberty; and soon after this, Henry, as if he had resolved to give each party the advantage by turns, granted every one permission to have a translation of the Bible, which had been newly made, in his family.

In 1540, the king again complained to parliament of the great diversity of religious tenets which prevailed among his subjects; a grievance, he affirmed, which ought the less to be endured, because the scriptures were now published in England, and ought universally to be the standard of belief to mankind. But he had appointed, he said, some bishops and divines to draw up a list of tenets; and he was determined that Christ and the truth should have the victory; whence he seems to have expected more from this new book of his doctors, than had ensued from the publication of the scriptures. Cromwell, as vicar-general, also made a speech in the upper house; and the peers in return told him, that he deserved to be vicar-general to the universe: To such a degree of mean and servile submission was the English parliament at this time reduced.

This year also the king suppressed the only religious order remaining in England; namely, the knights of St John of Jerusalem, or the *knights of Malta*, as they are commonly called. This order had by their valour done great service to Christendom; and had very much retarded, at Jerusalem, Rhodes, and Malta, the rapid progress of the barbarians. During the general surrender of the religious houses in England, they had obstinately refused to give up their revenues to the king; and Henry, who would endure no society that professed obedience to the pope, was obliged to have recourse to parliament for the dissolution of this order. Their revenues were large, and formed a considerable addition to the acquisitions which the king had already made. But he had been such a bad economist, that, notwithstanding the immense plunder afforded him by the church, he now demanded from parliament a very considerable supply. The commons, however, though lavish of the blood of their fellow-subjects, were extremely frugal of their money; and it was not without murmuring that the grant could be obtained, even by this absolute and dreaded monarch.

The king all this time continued to punish with unrelenting severity the Protestants who offended against the law of the six articles, and the Papists who denied his supremacy; which gave occasion to a foreigner at that time to say, that those who were against the Pope were burned, and those who were for him were hanged. The king even seemed to display in an ostentatious manner his tyrannical justice and impartiality which reduced both parties to subjection. This year he executed three Protestants and three Papists coupled together. The latter declared, that the most grievous part of their punishment was the being coupled to such heretical miscreants as suffered with them.

In 1542, Henry proceeded to the further dissolution of colleges, hospitals, and other foundations of that nature. The courtiers had been dealing with the presidents and governors to make a surrender of their

England. revenues to the king; and they had succeeded with eight. But there was an obstacle to their farther progress: it had been provided by the local statutes of most of these foundations, that no president nor any fellows could make such a deed without the unanimous consent of all the fellows. This consent would not have been easily obtained; but the parliament proceeded in a summary manner to annul all these statutes; by which means the revenues of those houses were exposed to the rapacity of the king and his favourites. Henry also now extorted from many bishops a surrender of their chapter-lands; by which means he pillaged the sees of Canterbury, York, and London, and enriched his favourites with their spoils. He engaged the parliament to mitigate the penalties of the six articles, as far as regarded the marriage of priests, which was now only subjected to a forfeiture of goods, chattels, and lands during life: he was still equally bent on maintaining a rigid purity in speculative principles. He had appointed a commission consisting of two archbishops and several bishops of both provinces, together with a considerable number of doctors of divinity; and by virtue of his ecclesiastical supremacy he had charged them to choose a religion for his people. Before the commissioners, however, had made any progress in this arduous undertaking, the parliament had passed a law by which they ratified all the tenets which these divines should establish with the king's consent; and thus they were not ashamed of declaring expressly that they took their religion upon trust, and had no other rule either in religious or temporal concerns than the arbitrary will of their master. One clause of the statute, however, seems to favour somewhat of the spirit of liberty. It was enacted, that the ecclesiastical commissioners should establish nothing repugnant to the laws and statutes of the realm. But in reality this proviso was inserted by the king, to serve his own purposes. By introducing a confusion and contradiction into the laws, he became more the master of every one's life and property; and as the ancient independence of the church still gave him jealousy, he was well pleased, under colour of such a clause, to introduce appeals from spiritual to civil courts. For the same reason he would never promulgate a body of canon law; and he encouraged the judges on all occasions to interpose in ecclesiastical causes, wherever they thought the law or the prerogative concerned. Being thus armed by the authority of parliament, or rather by their acknowledgment of his spiritual supremacy, the king employed his commissioners to select a system of tenets for the assent and belief of the nation. A small volume was published, under the title of *The Institution of a Christian Man*, which was received by the convocation, and made the infallible standard of orthodoxy. In this book the points of justification, faith, free-will, good works, and grace, were discussed in a manner somewhat favourable to the opinions of the reformers. The sacraments, which a few years before were only allowed to be three, were now increased to seven, conformably to the sentiments of the Catholics. Throughout the whole of this book the king's caprice is very discernible; and the book is in reality to be regarded as his composition. For Henry, while he made his opinion a rule for the nation, would himself submit to no authority whatever; not even to any which he had formerly established. The

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same year the people had a farther instance of the king's inconsistency. He ordered a new book to be composed, called the *Erudition of a Christian Man*; and without asking the consent of the convocation, he published by his own authority this new model of orthodoxy. He was no less positive in his new creed than he had been in the old one; but though he required the faith of the nation to veer about at his signal, he was particularly careful to inculcate the doctrine of passive obedience in all his books, and he was no less careful to retain the nation in the practice.

But while the king was thus spreading his own books among the people, both he and the clergy seem to have been very much perplexed with regard to the scriptures. A review had been made by the ecclesiastical synod of the new translation of the Bible; and Bishop Gardiner had proposed, that instead of employing English expressions throughout, several Latin words should still be preserved, because they contained, as he pretended, such peculiar energy and significance, that they had no correspondent terms in the English tongue. Among these were *ecclesia*, *pœnitentia*, *pontifex*, *contritus*, &c. But as this mixture would appear extremely barbarous, and was plainly calculated for no other purpose than to retain the people in their ancient ignorance, the proposal was rejected. The knowledge of the people, however, seemed to be still more dangerous than their ignorance; and the king and parliament, soon after the publication of the scriptures, retracted the concession which they had formerly made, and prohibited all but gentlemen and merchants to peruse them. Even that liberty was not granted without an apparent hesitation, and dread of the consequences. These persons were allowed to read, *so it be done quietly and with good order*. And the preamble to the act sets forth, "That many seditious and ignorant persons had abused the liberty granted them of reading the Bible; and that great diversity of opinion, animosities, tumults, and schisms, had been occasioned by perverting the sense of the scriptures." The mass-book also passed under the king's examination; but little alteration was yet made in it. Some doubtful or fictitious saints only were struck out; and the name of the pope was erased. The latter precaution was also used with every new book that was printed, and even every old one that was sold. The word *pope* was carefully omitted or blotted out; as if that precaution could abolish the term from the language, or cause the people forget that such a person existed. About this time also, the king prohibited the acting of plays, interludes, and farces, in derision of the Popish superstitions; which the Protestants had been in use to practise: and this prohibition was in the highest degree pleasing to the Roman Catholics.

In this tyrannical and head strong manner Henry proceeded with regard to ecclesiastical affairs. In other respects his conduct was equally violent. With regard to his domestic concerns, history scarce affords his parallel. We have already taken notice of his extreme love for Anne Boleyn, whom he married, contrary even to his own principles, before the marriage with Catharine was dissolved. His affection for the former was carried to such an height, that he even procured an act excluding from the succession the issue of Queen Catharine, in favour of the children of Anne

England. Anne Boleyn; and failing them to the king's heirs for ever. An oath to this purpose was likewise enjoined, under penalty of imprisonment during the king's pleasure, and forfeiture of goods and chattels. All slander against the king and his new queen or their issue, was subjected to the penalty of treason or misprision of treason. The reason given for this extreme severity toward his own child was, that her mother had obstinately refused to quit the kingdom, notwithstanding all the methods he could take to induce her to do so. The oath was generally taken throughout the kingdom; Sir Thomas More the chancellor, and Fisher bishop of Rochester, being the only persons who refused; for which both of them were imprisoned, and soon after executed. The unfortunate queen Catharine died, in her retreat at Amphythill, in the year 1536. On her death-bed she wrote a most pathetic letter to the king, in which she forgave him all the injuries she had received, and recommended to him in the strongest terms their daughter the princess Mary. This letter affected Henry so much, that he could not read it without tears; but the new queen is said to have exulted in such a manner on hearing of the death of her rival, as was quite inconsistent with either decency or humanity. Her triumph, however, was of short duration. Henry had no sooner possessed her, secure from every disquieting thought by the death of queen Catharine, than his passion began to decline; and to this her delivery of a dead son did not a little contribute; for so impetuous and absurd were his passions, and such was his desire for male issue, that the disappointment in this respect alone was sufficient to alienate his affection from his wife. The levity of her temper, and her extreme gaiety of behaviour bordering upon licentiousness, as related under the article *BOLEYN*, also gave an opportunity to her enemies of enflaming the king's jealousy against her. The viscountess of Rocheford, in particular, a woman of profligate manners, and who was married to the queen's brother, had the cruelty to report to the king that her husband committed incest with his own sister; and, not content with this, she interpreted every instance of favour shown by her to a man, as proof of a criminal intercourse between them. At the same time it must not be forgot, that he who insisted on such rigid fidelity from his wives, was himself the most faithless of mankind. He had doubts, it may be allowed, about the legality of his marriage with Queen Catharine, but his doubts were evidently confirmed by the charms of Anne Boleyn. After being fatiated with the possession of her for six years, perhaps he really doubted her fidelity; but here again his doubts were confirmed by the beauty of Jane Seymour, with whom he had now fallen in love. It may easily be believed, that from this consideration alone there was no reason to hope that ever the unfortunate Anne would be able to exculpate herself. Had she really been guilty, her monster of a husband might have allowed her to live; but his cruelty was as unbounded and insatiable as his other perverse passions. She was condemned; and the sentence pronounced against her was, that she should be burned or beheaded at the king's pleasure. On hearing this dreadful denunciation, she exclaimed, "O Father! O Creator! thou who art the way, the truth, and the life! thou knowest that I have not deserved this fate." She then made the most solemn protestations of inno-

cence before her judges; but these, as they had been from the beginning ineffectual, so it was not to be supposed that they could now avail any thing. Anne was beheaded by the executioner of Calais, who was reckoned more expert than any in England; and Henry enjoyed the pleasure of marrying his beloved Jane Seymour. His satisfaction, however, was of no long continuance: for the queen, becoming pregnant immediately after marriage, died in two days after the birth of the child; who being a son, was baptised by the name of Edward VI. As this lady had been more beloved by Henry than any of his other wives, his grief for the loss of her was extreme. However, it did not hinder him from entering very soon afterwards into a new matrimonial scheme; in which he met with many difficulties. His first proposals were made to the duchess dowager of Milan, niece to the emperor and to Catharine his own former queen; but as he had behaved so indifferently to the aunt, it is scarce to be supposed that his addresses could prove agreeable to the niece. On this he demanded the duchess-dowager of Longueville, daughter of the duke of Guise; but on making the proposal to the French monarch, Francis I. he was informed that the princess had been already betrothed to the king of Scotland. Henry, however, would take no refusal. He had learned that the object of his affection was endowed with many accomplishments, was very beautiful, and of a large size, which last property he looked upon to be necessary for him who was now become somewhat corpulent himself. Francis, to prevent any more solicitations on this subject, sent the princess to Scotland, but at the same time made Henry an offer of Mary of Bourbon, daughter of the Duke of Vendosme. This princess was rejected by Henry, because he had heard of her being formerly refused by the king of Scotland. He was then offered his choice of the two younger sisters of the queen of Scotland, both of them being equal in merit as well as size to the one whom he had desired: but Henry, unwilling to trust to any reports concerning the beauty of these ladies, or even to their pictures, proposed to Francis, that they should have a conference at Calais under pretence of business, and that the latter should bring with him the two princesses of Guise with the finest ladies of quality in France, that he might make a choice. This indelicate proposal shocked Francis: he returned for answer, that he was too much impressed with regard for the fair-sex to carry ladies of the first quality, like geldings, to a market, to be chosen or rejected according to the humour of the purchaser. Henry remonstrated and stormed as usual; but though Francis at this time earnestly wished to oblige him, he at last totally rejected the proposal. Negotiations were then entered into for a German match; and the princess of Cleves was proposed by Cromwell, on account of the great interest her father had with the Protestant princes of Germany. Henry had also become enamoured of her person from a picture of her he had seen: but this, tho' drawn by an eminent artist, was unluckily done so much to the advantage, that when the negotiation was quite finished, and the bride arrived in England, he lost all patience, swearing that she was a great Flanders mare, and that he could never bear her the smallest affection. The matter was still worse, when he found that she

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Indecent behaviour of the new queen on hearing of the death of Catharine.

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could speak no language but Dutch, of which he was entirely ignorant. Notwithstanding all these objections, however, he resolved to complete the marriage, telling Cromwell, that since he had gone so far, he must now put his neck into the yoke. The reason of this was, that the friendship of the German princes was now more than ever necessary for Henry; and it was supposed that the affront of sending the princess back to her own country might be repented. Cromwell, who knew that his own life depended on the event of the matter, was very anxious to learn from the king how he liked his spouse after having passed a night with her; but was struck with terror when he replied that he now hated her more than ever; that he was resolved not to cohabit with her, and even suspected that she was not a virgin; a matter in which he pretended to be a *connoisseur*, and about which he was extremely scrupulous. In a little time his aversion increased to such a degree, that he determined at any rate to get rid of his queen and prime minister both at once. Cromwell had long been an object of aversion to the nobility, who hated him on account of his obscure birth; his father being no other than a blacksmith, though the son had obtained the first employments in the kingdom. By his office of vicar-general, he had an almost absolute authority over the clergy; he was also lord privy-seal, lord-chamberlain, and master of the wards. He had also been invested with the order of the garter; and was created earl of Essex. This was sufficient to raise the envy of the courtiers: but he had also the misfortune to fall under the displeasure of both Protestants and Papists; the former hating him on account of his concurrence with Henry in their persecution, and the latter looking upon him as the greatest enemy of their religion. To these unfortunate circumstances on the part of Cromwell, was added the usual situation of Henry himself, who had now fallen in love with Catharine Howard, niece to the Duke of Norfolk; to enjoy whom, he now determined to divorce Anne of Cleves. By the insinuations of this lady and her uncle, Cromwell's ruin was accomplished; and he was condemned, not only without any trial, but even without examination. The charge was of heresy and high treason; but the instances of the latter were quite absurd and ridiculous. He submitted, however, to his sentence without murmuring, as knowing that his complaints on this subject would be revenged on his son. He was terribly mangled by the executioner before his head could be struck off. His death was soon followed by the dissolution of the marriage with the princess of Cleves, which was annulled by the consent of both parties. The princess parted from him with great indifference; and accepted of L. 3000 a-year as a compensation, but refused to return to her own country after the affront she had received.

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The marriage annulled and Cromwell put to death.

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Henry falls in love with Catharine Howard.

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Infidelity and death of the new queen.

The king's marriage with Catharine Howard soon followed the dissolution of that with Anne of Cleves; but the event may surely be regarded as a providential punishment upon this tyrant, whose cruelty, lust, and other bad qualities, can scarcely be matched in history. We have already mentioned his insinuations against the virtue of the unfortunate princess of Cleves, were amply repaid by the actual infidelities of his new queen,

whom we must suppose he believed to be a pure and perfect virgin at the time he married her. So happy indeed did he imagine himself in this new marriage, that he publicly returned thanks for his conjugal felicity, when a most unfortunate information concerning the queen's incontinence was given to Cranmer by one of the name of Lascelles, whose sister had been servant to the duchess-dowager of Norfolk. He not only gave intelligence of her amours before marriage, but affirmed that she had continued the same criminal practices ever since. Two of her paramours were arrested, and confessed their crimes: the queen herself also confessed guilt before marriage, but denied having ever been false to the king's bed; which, however, had very little probability. She was beheaded on Tower-hill, along with the viscountess of Rochford, who had been a confidant in her amours. The latter, as has already been observed, was a principal instrument in procuring the destruction of the unhappy Anne Boleyn, and therefore died unpitied; while the virtuous character of that unfortunate lady received an additional confirmation from the discovery of this woman's guilt.

To secure himself from any farther disasters of this kind, Henry passed a most extraordinary law, enacting that any one who should know, or strongly suspect any guilt in the queen, might, within 20 days, disclose it to the king or council, without incurring the penalty of any former law against defaming the queen; though at the same time every one was prohibited from spreading the matter abroad, or even privately whispering it to others. It was also enacted, that if the king married any woman who had been incontinent, taking her for a true maid, she should be guilty of treason if she did not previously reveal her guilt to him.

These laws afforded diversion to the people, who now said that the king must look out for a widow; as no reputed maid would ever be persuaded to incur the penalty of the statute. This in truth happened to be the case at last; for about a year after the death of Catharine Howard, he married, for his sixth wife, Catharine Parr, widow of Nevil Lord Latimer. This lady, being somewhat inclined to the doctrines of the reformation, and having the boldness to tell her husband her mind upon the subject, had like to have shared the fate of the rest. The furious monarch, incapable of bearing the least contradiction, instantly complained to Bishop Gardiner, who inflamed the quarrel as much as possible; so that at last the King consented that articles of impeachment should be drawn up against her. But these were rendered abortive by the prudence and address of the queen, as related under the article PARR.

All this time Henry had tyrannized over his nobility in the most cruel manner. The old countess of Salisbury, the last of the house of Plantagenet, was executed with circumstances of great cruelty. She had been condemned, as usual, without any trial; and when she was brought to the scaffold, refused to lay her head on the block in obedience to a sentence, to the justice of which she had never consented. She told the executioner, therefore, that if he would have her head, he must win it the best way he could; and thus she ran about the scaffold, pursued by the executioner,

England.

288
Absurdity of the king.

289
Sixth marriage with Catharine Parr, whom he intended also to put to death.

290
Monstrous cruelty of the king.

England. tioner, who aimed many fruitless blows at her neck before he was able to put an end to her life. Soon after her, the lord Leonard Grey was likewise executed for treason, but we have very little account of this transaction.

291
Attainder
of Norfolk
and Surry.

The last instances of the king's injustice and cruelty were the duke of Norfolk and his son the earl of Surry. The former had served the king with fidelity, and the latter was a young man of the most promising hopes. His qualifications, however, were no security against the violence of Henry's temper. He had dropped some expressions of resentment against the king's ministers, who had displaced him from the government of Boulogne; and the whole family had become obnoxious on account of the late Queen Catharine Howard. From these motives, orders were given to arrest both the father and son; and accordingly they were arrested both on the same day, and confined to the Tower. The duchess-dowager of Richmond, Surry's own sister, was among the number of his accusers; and Sir Richard Southwell also, his most intimate friend, charged him with infidelity to the king. Surry denied the charge, and challenged his accuser to a single combat. This favour was denied him; and, notwithstanding his eloquent and spirited defence, he was condemned and executed at Tower-hill.—The duke of Norfolk vainly endeavoured to mollify the king by letters and submissions. An attainder was found against him, though the only crime his accusers could allege was, that he had once said that the king was sickly, and could not hold out long; and that the kingdom was likely to be torn between the contending parties of different persuasions. Cranmer, though engaged for many years in an opposite party to that of Norfolk, and though he had received many and great injuries from him, would have no hand in such an unjust prosecution; but retired to his seat at Croydon. The death-warrant, however, was made out, and immediately sent to the lieutenant of the Tower; but a period was put to the cruelties and violence of the king by his death, which happened on the 14th of January 1547, the night before Norfolk was to have been executed.

292
Henry dies,
and is suc-
ceeded by
Edward VI.

Henry was succeeded by his only son Edward, a boy of nine years of age. The most remarkable transactions of his reign are those with regard to religion. The restraint which Henry VIII. had laid upon the Protestants was now taken off; and they not only maintained their doctrines openly, but soon became the prevailing party. Henry had fixed the majority of his son at 18 years of age; and, in the mean time, appointed 16 executors of his will, to whom, during the minority, he entrusted the government of the king and kingdom. This will, he imagined, would be obeyed as implicitly after his death as though he had been alive. But the first act of the executors was to choose the earl of Hertford, afterwards duke of Somerset, protector of the realm; and in him was lodged all the regal power, together with a privilege of naming whom he pleased for his privy council.

293
Reforma-
tion com-
pleted.

The duke of Somerset had long been reckoned a secret partisan of the reformers; and, immediately on his elevation to his present high dignity, began to express his intention of reforming the abuses of the ancient religion. Under his direction and that of Cran-

mer, therefore, the reformation was carried forward and completed. The only person of consequence who opposed the reformers was Gardiner bishop of Winchester; and, to the disgrace of their own principles, the reformers now showed that they could persecute as severely as the Papists had formerly persecuted them. Gardiner was committed to the Fleet prison, where he was treated with great severity. He was afterwards sent to the Tower; and having continued there two years, he was commanded to subscribe several articles, among which was one confessing the justice of his own imprisonment. To all the articles but this he agreed to subscribe; but that did not give satisfaction. He was then committed to close custody; his books and papers were seized; all company was denied him, and he was not even permitted the use of pen and ink. The bishops of Chichester, Worcester, and Exeter, were in like manner deprived of their offices; but the bishops of Landaff, Salisbury, and Coventry, escaped by sacrificing the most considerable share of their revenues. The libraries of Westminster and Oxford were ordered to be ransacked, and purged of the Romish legends, missals, and other superstitious volumes; in which search, great devastation was made even in useful literature. Many volumes clasped in silver were destroyed for the sake of their rich bindings; many of geometry and astronomy were supposed to be magical, and destroyed on that account; while the members of the university, unable to put a stop to these ravages, trembled for their own safety.

294
The refor-
mers perse-
cute the ca-
tholics.

The reformers, however, were not contented with severities of this kind. A commission was granted to the primate and others, to search after all Anabaptists, heretics, or contemners of the new liturgy. Among the numbers who were found guilty upon this occasion, was one Joan Boucher, commonly called *Joan of Kent*; who was so very obstinate, that the commissioners could make no impression upon her. She maintained an abstruse metaphysical sentiment, that Christ, as man, was a sinful man; but, as the Word, he was free from sin, and could be subject to none of the frailties of the flesh with which he was clothed. For maintaining this doctrine, the poor woman was condemned to be burnt to death as an heretic. The young king, who it seems had more sense than his teachers, refused at first to sign the death-warrant: but at last, being overcome by the importunities of Cranmer, he reluctantly complied; declaring, that if he did wrong, the sin should be on the head of those who had persuaded him to it. The primate, after making another unsuccessful effort to reclaim the woman from her opinions, committed her to the flames. Some time after, one Van Paris, a Dutchman, was condemned to death for Arianism. He suffered with so much satisfaction, that he hugged and caressed the faggots that were consuming him.

The rest of this reign affords only the history of intrigues and cabals of the courtiers one against another. The protector was first opposed by his own brother admiral Sir Thomas Seymour, who had married Catharine Parr the late king's widow. She died soon after the marriage; and he then made his addresses to the princess Elizabeth, who is said not to have been averse to the match. His brother the duke, who was at that time in the north, being informed of his

England. his ambitious projects, speedily returned, had him at-
tainted of high treason, and at last condemned and ex-
ecuted. The duke of Somerset himself, however, was
some time afterwards deprived of his office by Dudley
duke of Northumberland; who at last found means to
get him accused of high treason, and executed. Not
satisfied with the office of protector, which he assumed
on the death of Somerset, this ambitious nobleman
formed a scheme of engrossing the sovereign power al-
together. He represented to Edward, who was now
in a declining state of health, that his sisters Mary
and Elizabeth, who were appointed by Henry's will
to succeed, in failure of direct heirs, to the crown,
had both been declared illegitimate by parliament; that
the queen of Scots his aunt, stood excluded by the
king's will; and, being an alien also, lost all right of
succeeding. The three princesses being thus excluded,
the succession naturally devolved to the marchioness of
Dorset eldest daughter of the French queen, Henry's
sister, who had married the earl of Suffolk after her first
husband's death. The next heir to the marchioness was
Lady Jane Gray, a lady universally respected, both on
account of the charms of her person, and the virtues
and endowments of her mind. The king, who was
accustomed to submit to the politic views of this
minister, agreed to have the succession submitted to
council, where Northumberland hoped to procure
an easy concurrence. The judges, however, who
were appointed to draw up the king's letters patent
for this purpose, warmly objected to the measure;
and gave their reasons before the council. They
begged that a parliament might be summoned, both
to give it force, and to free its partisans from dan-
ger: they said that the form was invalid, and would
not only subject the judges who drew it, but every
counsellor who signed it, to the pains of treason.
Northumberland could not brook their demurs; he
threatened them with his authority, called one of
them a *traitor*, and said he would fight with any man
in his shirt in such a just cause as that of Lady Jane's
succession. A method was therefore found out of
screening the judges from danger, by granting them
the king's pardon for what they should draw up;
and at length the patent for changing the succession
was completed, the princesses Mary and Elizabeth
were set aside, and the crown settled on the heirs of the
duchess of Suffolk (for she herself was contented to
forego her claim.)

For some time the king had languished in a consump-
tion. After this settlement of the crown, his health
visibly declined every day, and little hopes were enter-
tained of his recovery. To make matters worse, his
physicians were dismissed by Northumberland's advice,
and by an order of council; and he was put into the
hands of an ignorant old woman, who undertook in a
little time to restore him to health. After the use of
her medicines all his bad symptoms increased to the
most violent degree. He felt a difficulty of speech
and breathing; his pulse failed, his legs swelled, his
colour became livid, and many other signs of approach-
ing death made their appearance. He expired at Green-
wich on the 6th of July 1553, in the 16th year of his
age and 7th of his reign.

After the death of King Edward, very little regard
was paid to the new patent by which Lady Jane Gray
N^o 117.

had been declared heir to the throne. The undoubt-
ed title of Mary, notwithstanding the scandalous be-
haviour of her father and his servile parliaments, was
acknowledged by the whole nation. Northumberland,
however, was resolved to put the late king's will in ex-
ecution. He therefore carefully concealed the death of
Edward, in hopes of securing the person of Mary, who
by an order of council had been required to attend her
brother during his illness; but she being informed of
his death, immediately prepared to assert her right to
the crown. Northumberland then, accompanied by
the duke of Suffolk, the earl of Pembroke, and some
other noblemen, saluted Lady Jane Gray queen of
England. Jane was in a great measure ignorant of
these transactions, and it was with the utmost difficul-
ty she was persuaded to accept of the dignity conferred
upon her. At last she complied, and suffered herself
to be conveyed to the Tower, where it was then usual
for the sovereigns of England to pass some days after
their accession. Mary, however, who had retired to
Kenning-hall in Norfolk, in a very few days found
herself at the head of 40,000 men; and Lady Jane re-
signed the sovereignty in ten days, with much more
pleasure than she had received it. She retired with her
mother to their own habitation; and Northumberland
finding his affairs quite desperate, attempted to quit
the kingdom. But he was stopped by the band of pen-
sioner guards, who informed him that he must stay to
justify their conduct in taking arms against their law-
ful sovereign. He therefore surrendered himself to
Mary; and was soon after executed, together with Sir
John Gates and Sir Thomas Palmer, two infamous
tools of his power. Sentence was also pronounced a-
gainst Lady Jane Gray and her husband Lord Guild-
ford; but without any intention of putting it in ex-
ecution against them at present, as their youth and in-
nocence pleaded so strongly in their favour, neither of
them having yet reached their 17th year.

Mary now entered London, and was peaceably set-
tled on the throne without any effusion of blood. The
English, however, soon found reason to repent their
attachment to her cause. Though she had at first so-
lemnly promised to defend the religion and laws of
her predecessor, she no sooner saw herself firmly estab-
lished on the throne, than she resolved to restore the
Popish religion, and give back their former power to
the clergy. Gardiner, Bonnar, and the other bishops
who had been imprisoned or suffered loss during the
last reign, were taken from prison, reinstated in their
sees, and now triumphed in their turn. On pretence
of discouraging controversy, the queen by her preroga-
tive silenced all preachers throughout England, except
such as should obtain a particular license, and this she
was resolved to give only to those of her own persua-
sion. The greater part of the foreign Protestants took
the first opportunity of leaving the kingdom; and ma-
ny of the arts and manufactures, which they had suc-
cessfully introduced, fled with them. Soon after, the
queen called a parliament, which seemed willing to
concur in all her measures. They at once repealed all
the statutes with regard to religion that had passed
during the reign of Edward VI. and the national reli-
gion was again placed on the same footing in which it
had been at the death of Henry VIII.

To strengthen the cause of the Catholics, and give
the

295
Lady Jane
Gray decla-
red heir to
the crown.

297
Lady Jane
Gray pla-
ced on the
throne, but
is forced to
resign it.

298
Mary de-
clared
queen.

²⁹⁹ England. the queen more power to establish the religion to which she was so much attached, a proper match was to be fought for her; and it was supposed that three had already been proposed as candidates for her favour. Her affection seemed to be engaged by the earl of Devonshire; but as he was rather attached to the Princess Elizabeth, he received the overtures which were made him from the queen with neglect. The next person mentioned as a proper match for her was Cardinal Pole, a man greatly respected for his virtues; but as he was now in the decline of life, Mary soon dropped all thoughts of that alliance. At last she cast her eye on Philip II. of Spain, son to the Emperor Charles V. He was then in the 27th year of his age, and consequently agreeable in that respect to Mary, who was in her 48th year; but when her intentions with regard to this match became known, the greatest alarm took place throughout the whole nation.

Proposals of marriage to Queen Mary.

³⁰⁰ Alliance with Spain generally disagreeable.

The commons presented such a strong remonstrance against a foreign alliance, that the queen thought proper to dissolve the parliament in order to get quit of their importunity. To obviate, however, all clamour, the articles of marriage were drawn up as favourably as possible for the interests of England. It was agreed, that though Philip should have the title of king, the administration should be entirely in the queen; that no foreigner should be capable of holding any office in the kingdom; nor should any innovation be made in the laws, customs, and privileges of the people; that Philip should not carry the queen abroad without her consent, or any of her children without the consent of the nobility. Sixty thousand pounds a-year were to be settled upon her as a jointure; and the male issue of this marriage were to inherit Burgundy and the Low Countries as well as the crown of England: and in case of the death of Don Carlos, Philip's son by his former marriage, without any heir, the queen's issue should inherit all the rest of the Spanish dominions also.

³⁰¹ Wyatt's insurrection. All these concessions, however, were not sufficient to quiet the apprehensions of the people: they were considered merely as words of course, which might be retracted at pleasure; and the whole nation murmured loudly against a transaction so dangerous to its ancient liberty and independence. An insurrection was raised by Sir Thomas Wyatt, a Roman Catholic, at the head of 4000 men, who set out from Kent to London, publishing a declaration against the Spanish match and the queen's evil counsellors. Having advanced as far as Southwark, he required that the queen should put the Tower of London into his hands; that she should deliver four counsellors as hostages; and, in order to ensure the liberty of the nation, should marry an Englishman. But his force was at present by far too small to support such magnificent pretensions; and he unluckily wasted so much time without attempting any thing of importance, that the popular ferment entirely subsided, his followers abandoned him gradually, and he was at last obliged to surrender himself to Sir Maurice Berkeley near Temple-bar. His followers were treated with great cruelty, no fewer than 400 of them suffering by the hand of the executioner; 400 more were conducted with ropes about their necks into the queen's presence, and there received their

³⁰² He is condemned and executed with many of his followers.

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pardon. Wyatt himself was condemned and executed. England.

³⁰³ Princess Elizabeth harshly treated. This rebellion had almost proved fatal to the Princess Elizabeth, who for some time past had been treated with great severity by her sister. Mary, who possessed a most malignant and cruel heart, had never forgotten the quarrel between their mothers; and when a declaration was made after her own accession, recognising Queen Catharine's marriage as legal, she was thus furnished with a pretence for accounting Elizabeth illegitimate. She was likewise obnoxious on account of her religion, which Elizabeth at first had not prudence sufficient to conceal; though afterwards she learned full well to disguise her sentiments. But above all, her standing so high in the affection of the Earl of Devonshire, was a crime not to be forgiven; and Mary made her sensible of her displeasure by numberless mortifications. She was ordered to take place at court after the Duchesses of Suffolk and the Countesses of Lennox; to avoid which, and other indignities, Elizabeth at last retired from court altogether into the country. After the suppression of Wyatt's rebellion she was committed to the Tower, and underwent a strict examination before the council; but as Wyatt had made a declaration on the scaffold that she was in no manner of way concerned, the queen found herself under a necessity of releasing her. To get rid of such a troublesome rival, however, she was offered in marriage to the Duke of Savoy; and on Elizabeth's declining the proposal, she was committed close prisoner to Woodstocke. The rebellion proved fatal, however, to many persons of distinction, and gave the queen an opportunity of manifesting that unbounded cruelty which reigned in her heart. The Tower, and all the prisons in the kingdom, were filled with nobility and gentry, who became objects of royal vengeance, more on account of their credit and interest with the people than any concern they were supposed to have had with Wyatt. Sir Nicholas Throgmorton was tried in Guildhall; but as no satisfactory evidence appeared against him, the jury gave a verdict in his favour. The queen was so much enraged at this disappointment, that she re-committed him to the Tower, summoned the jury before the council, and at last sent them all to prison, fining them afterwards some of 1000 l. and others of 2000 l. each. Sir John Throgmorton, brother to Sir Nicholas just mentioned, was condemned and executed upon evidence which had been already rejected as insufficient. But of all those who perished on this occasion, none excited more universal compassion than the unfortunate Lady Jane Grey and her husband Lord Guilford Dudley. They had already received sentence of death, as has been mentioned; and two days after the execution of Wyatt, they received orders to prepare for eternity. Lady Jane, who had been in expectation of this blow, was no way intimidated, but received the news with the most heroic resolution. The place intended at first for their execution was Tower-hill; but the council, dreading the effects of the people's compassion for their youth, beauty, and innocence, gave directions that they should be beheaded within the verge of the Tower. The duke of Suffolk was soon after tried, condemned, and executed; but would have met with more compassion, had not his

³⁰⁴ Execution of Lady Jane Grey and her husband.

England. ambition been the cause of his daughter's unhappy fate just mentioned. Sir Thomas Gray also lost his life on the same account: but the cruel spirit of Mary was still unsatisfied; and finding herself universally odious, that she might free herself from any apprehensions for what was past, as well as tyrannize with the more freedom in time to come, she disabled the people from resistance, by ordering general musters, and causing the commissioners seize their arms and lay them up in forts and castles.

305
The people
disarmed.

Notwithstanding this unpopularity, however, the rebellion of Wyatt had so strengthened the hands of government, that a parliament was assembled in hopes of gratifying the queen's wishes in regard to her marriage with Philip of Spain. To facilitate this purpose also, the emperor of Germany sent over to England 400,000 crowns to be distributed among the members of parliament in bribes and pensions; a practice of which there had hitherto been no example in England. The queen, notwithstanding her bigotry, resumed the title of *Supreme Head of the Church*, which she had dropped three months before. Gardiner made a speech, in which he proposed, that they should invest the queen with a legal power of disposing of the crown, and appointing her successor; but the parliament, however obsequious in other respects, did not choose to gratify their sovereign in a measure by which the kingdom of England might become a province of the Spanish monarchy. They would not even declare it treason to imagine or attempt the death of the queen's husband during her life-time, though they agreed to ratify the articles of marriage. Finding therefore that the parliament even yet was not sufficiently obsequious, it was thought most proper to dissolve them. Soon after this the marriage with Philip was solemnized; but as the latter had espoused his queen merely with a view to become king of England, he no sooner found himself disappointed in this than he showed a total want of affection for her as a wife. He passed most of his time at a distance from her in the Low Countries; and seldom wrote to her except when he wanted money, with which Mary would at all times gladly have supplied him even had it been at the expence of her kingdom, if in her power.

306
Marriage
with Philip
solemnized.

307
Protestants
persecuted.

The enemies of the state being supposed to be suppressed, those of the Catholic religion were next persecuted. The old sanguinary laws which had been rejected by a former parliament were now revived. Orders were given, that the priests and bishops who had married should be ejected; that the mass should be restored, and the pope's authority established; and that the church and its privileges, all but their goods and estates, should be put on the same footing on which they were before the commencement of the reformation. But as the gentry and nobility had already divided the churchlands among them, it was thought inconvenient, and indeed impossible, to make a restoration of these. The persons who chiefly promoted these measures were Gardiner bishop of Winchester, and Cardinal Pole, who was a kinsman of Henry VIII. but had been long in Italy, and was now returned from it. The latter was for tolerating the Protestants; but the former, perceiving that rigorous measures would be most agreeable to the king and queen, declared himself against it. He was too prudent, however, to appear in person at the

head of the persecution; and therefore consigned that office to Bonner bishop of London, a man of a very abandoned character. The bloody scene began by the execution of Hooper bishop of Gloucester, and Rogers prebendary of St Paul's. These were quickly followed by others, of whom the principal were Archbishop Cranmer, Ridley bishop of London, and Latimer bishop of Worcester*. These persecutions soon became odious to the whole nation, and the perpetrators of them were all willing to throw the blame from themselves upon others. Philip endeavoured to fasten the whole reproach upon Bonner; but that bishop would not take the whole, and therefore retorted on the court. A bold step was now taken to introduce a court similar to the Spanish inquisition, that should be empowered to try heretics, and condemn them without any other law but its own authority. But even this was thought a method too dilatory in the present exigence of affairs. A proclamation issued against books of heresy, treason, and sedition, declared, that whosoever had such books in his possession, and did not burn them without reading, should suffer as a rebel. This was attended with the execution of such numbers, that at last the magistrates who had been instrumental in these cruelties refused to give their assistance any longer. It was computed, that during this persecution, 277 persons suffered by fire, besides those punished by imprisonments, fines, and confiscations. Among those who suffered by fire were 5 bishops, 21 clergymen, 8 lay-gentlemen, 84 tradesmen, 100 husbandmen, 55 women, and 4 children.

The only remarkable transaction which happened during this reign with regard to the temporal affairs of the kingdom was the loss of Calais, which had been in the possession of the English for upwards of 200 years*. This loss filled the whole kingdom with complaints, and the queen with grief. She was heard to say, that, when dead, the name of *Calais* would be found engraven on her heart. She did not long survive this loss; but died in the year 1558, of a lingering illness, after a reign of five years four months and eleven days.

After the death of Mary, the Princess Elizabeth succeeded to the throne without opposition. She was at Hatfield when news of her sister's death were brought her; upon which she hastened up to London, where she was received with great joy. This princess was well qualified for government. She had judgment sufficient to make choice of proper ministers, and authority enough to keep her subjects in awe. The restraints also, to which she had been subjected during her sister's reign, had taught her so well to conceal her sentiments, that she had become a perfect mistress of dissimulation; which, though no commendable part of her character, proved occasionally of great service to her government. She perfected the reformation, and put the religion of England upon the same plan which subsists at present. This was accomplished without the least difficulty; for the persecutions in Mary's reign had served only to give the whole nation an aversion for popery. In the time of Edward VI. the people had been compelled to embrace the Protestant religion, and their fears induced them to conform; but now, almost the whole nation were Protestants from inclination. The reformation was confirmed by act of parliament in 1559, and thus

England.
* See Cranmer, &c.

308
Mary dies,
and is succeeded by
Elizabeth.

England. thus England was seen to change its religion four times in the space of 32 years.

309
Peace with
France.

During the time that the queen and her counsellors were employed in settling the religious affairs of the nation, negociations were likewise carried on for a peace between England and France; which was at last concluded on the following terms, viz. that Henry should restore Calais at the expiration of eight years; that in case of failure, he should pay 500,000 crowns, and Elizabeth's title to Calais still remain; that for the payment of this sum he should find the security of eight foreign merchants, not natives of France; and until that security were provided he should deliver five hostages. If during this interval Elizabeth should break the peace with France or Scotland, she should forfeit all title to Calais; but if Henry made war on Elizabeth, he should be obliged to restore the fortress immediately. This pacification was soon followed by an irreconcilable quarrel with Mary queen of Scotland; which was not extinguished but by the death of the Scottish princess; and that with such circumstances of accumulated treachery, hypocrisy, and dissimulation, as have stamped an indelible disgrace on the memory of Elizabeth. See the articles MARY and SCOTLAND.

310
Prepara-
tions for
war with
Spain.

Elizabeth having at last got rid of her rival in the year 1587, began to make preparations for resisting the Spanish invasion. Hearing that Philip was secretly fitting out a great navy to attack her, she sent Sir Francis Drake with a fleet to pillage his coasts and destroy his shipping. On this expedition he set sail with four capital ships furnished by the queen, and 26 others of various sizes furnished him by the merchants of London in hopes of sharing the plunder.

311
Exploits of
Sir Francis
Drake.

Having learned that a Spanish fleet richly laden was lying at Cadiz in readiness to set sail for Lisbon, he directed his course towards the former port, where he boldly attacked the enemy. Six galleys were obliged to take shelter under the cannon of the forts; he burned about 100 vessels laden with ammunition and naval stores; and destroyed a great ship belonging to the Marquis de Santa Croce. Thence setting sail for Cape St Vincent, he took by assault the castle situated on that promontory, with three other fortresses. Having next insulted Lisbon, he sailed to the Teneras, where after lying in wait for some time, he took a rich prize, and then returned to England; having by this short expedition taught the English to despise the huge and unwieldy ships of the enemy, and thus prepared them to act with more resolution against the formidable armament that now threatened to invade them.

312
Misfortune
of Philip's
scheme of
an invasion.

But though the expedition of Sir Francis Drake had retarded the intended invasion of England for a twelvemonth, it had not by any means induced Philip to abandon his design. During that interval he continued his preparations with the greatest assiduity, the more especially as the invasion of England seemed to be a necessary preparative for regaining his authority over the Netherlands, the revolted provinces having been strongly supported by Elizabeth. The fleet prepared at this time was superior to any thing then existing in the world; and no doubt being entertained of its success, it was ostentatiously styled the *Invincible Armada*. The miserable event of this expedition, and the total failure of all the mighty hopes of Philip, are related under the article ARMADA. The spirit and courage of the

English were now excited to attempt invasions in their turn; which they executed in numerous descents on the Spanish coasts; though these were only temporary, and designed not for permanent conquest, but to harass the enemy. It would be endless to relate all the advantages obtained over the enemy at sea, where the capture of every ship must have made a separate narrative. It is sufficient to observe, that the sea-captains of that reign are still considered as the boldest and most enterprising set of men that England ever produced; and among this number we are to reckon Raleigh and Howard, Drake, Cavendish, and Hawkins. The English navy then began to take the lead; and has since continued irresistible in all parts of the ocean.

Elizabeth continued to reign with great glory till the year 1603; but all her greatness could not prevent her from being extremely miserable before her death. She had caused her greatest favourite, and probably her lover, the earl of Essex*, to be executed. Though this execution could not be called unjust, the queen's affection (on being informed that he had at last thrown himself entirely on her clemency) returned to such a degree, that she thenceforth gave herself entirely over to despair. She refused food and sustenance; she continued silent and gloomy; sighs and groans were the only vent she gave to her despondence; and she lay for ten days and nights upon the carpet, leaning on cushions, which her maids brought her. Perhaps the faculties of her mind were impaired by long and violent exercise; perhaps she reflected with remorse on some past actions of her life, or perceived, but too strongly, the decays of nature, and the approach of her dissolution. She saw her courtiers remitting in their assiduity to her, in order to pay their court to James the apparent successor. Such a concurrence of causes was more than sufficient to destroy the remains of her constitution; and her end was now visibly seen to approach. Feeling a perpetual heat in her stomach, attended with an unquenchable thirst, she drank without ceasing, but refused the assistance of her physicians. Her distemper gaining ground, Cecil and the lord admiral desired to know her sentiments with regard to the succession. To this she replied, That as the crown of England had always been held by kings, it ought not to devolve upon any inferior character, but upon her immediate heir the king of Scotland. Being then advised by the archbishop of Canterbury to fix her thoughts upon God, she replied, that her thoughts did not in the least wander from him. Her voice soon after left her; she fell into a lethargic slumber, which continued some hours; and she expired gently without a groan, in the 70th year of her age, and 45th of her reign. She was succeeded by James I. king of Scotland; since which time, the history of both England and Scotland is comprehended under the article BRITAIN.

313
Grief and
misery of
Elizabeth.

314
Her death.

315
England,
how divi-
ded.

Since the Norman conquest, England has been divided into six circuits, each circuit containing a certain number of counties. Two judges are appointed for each circuit, which they visit in the spring and autumn, for administering justice to the subjects who are at a distance from the capital. In holding the lent (or spring) assizes, the northern circuit extends only to York and Lancaster; the assizes at Durham, Newcastle, Carlisle, and Appleby, being held only in the autumn,

England. autumn, and distinguished by the appellation of the *long circuit*. These circuits and counties are :

1. *Home Circuit* contains the counties of Essex, Hertford, Kent, Surry, and Suffex.
2. *Norfolk Circuit* contains those of Bucks, Bedford, Huntingdon, Cambridge, Suffolk, and Norfolk.
3. *Oxford Circuit*. Oxon, Berks, Gloucester, Worcester, Monmouth, Hereford, Salop, and Stafford.
4. *Midland Circuit*. Warwick, Leicester, Derby, Nottingham, Lincoln, Rutland, and Northampton.
5. *Western Circuit*. Hants, Wilts, Dorset, Somerset, Devon, and Cornwall.

6. *Northern Circuit*. York, Durham, Northumberland, Lancaster, Westmoreland, and Cumberland.

Middlesex and Cheshire are not comprehended in the above circuits; the former being the seat of the supreme courts of justice, and the latter a county palatine. There is still a court of chancery in Lancaster and Durham, with a chancellor; and there is a court of exchequer at Chester, of a mixed kind, both for law and equity, of which the chamberlain of Chester is judge: there are also other justices in the counties palatine to determine civil actions and pleas of the crown.

Besides the 40 counties into which England is divided, there are counties corporate, consisting of certain districts, to which the liberties and jurisdictions peculiar to a county have been granted by charter from the throne. Thus the city of London is a county distinct from Middlesex; the cities of York, Chester, Bristol, Norwich, Worcester, and the towns of Kingston upon Hull and Newcastle upon Tyne, are counties of themselves, distinct from those in which they lie. The same may be said of Berwick upon Tweed, which lies in Scotland, and has within its jurisdiction a small territory of two miles on the north side of the river. Under the name of a *town*, boroughs and cities are contained: for every borough or city is a town, though every town is not a borough or city.—An account of the English constitution and government is given under the articles KING, LORDS, COMMONS, PARLIAMENT, LAW, LIBERTY, RIGHTS, &c.

316
Religion.

The established religion of England is Episcopacy. Since the reign of Henry VIII. the sovereigns of England have been called, in public writs, the supreme heads of the church; but this title conveys no spiritual meaning, as it only denotes the regal power to prevent any ecclesiastical differences, or, in other words, to substitute the king in place of the pope before the reformation, with regard to temporalities and the internal economy of the church. The kings of England never intermeddle in ecclesiastical disputes, and are contented to give a sanction to the legal rights of the clergy.

The church of England, under this description of the monarchical power over it, is governed by two archbishops, and 24 bishops, besides the bishop of Sodor and Man, who, not being possessed of an English barony, does not sit in the house of peers. See ARCHBISHOP and BISHOP.

England contains about 60 archdeacons. Subordinate to them are the rural deacons, formerly styled *archpresbyters*, who signify the bishop's pleasure to his clergy, the lower class of which consists of parish-priests (who are called *rectors* or *vicars*), deacons, and

curates. See the articles CURATE, DEACON, PARSON, and VICAR.

The following is a list of the English bishoprics, with their revenues, as charged in the king's books: though that sum is far from being the real annual value of the see, yet it affords in forming a comparative estimate between the revenues of each see with those of another.

ARCHBISHOPRICS.		£.	s.	d.
Canterbury,	-	2682	12	2
York,	-	1610	0	0

BISHOPRICS.		£.	s.	d.
London,	-	2000	0	0
Durham,	-	1821	1	3
Winchester,	-	3124	12	8

These three bishops take precedence of all others in England, and the others according to the seniority of their consecrations.

Ely,	-	2134	18	6
Bath and Wells,	-	533	1	3
Hereford,	-	768	11	0
Rochester,	-	358	4	9
Lichfield and Coventry,	-	559	17	3
Chester,	-	420	1	8
Worcester,	-	929	13	3
Chichester,	-	677	1	3
St Asaph,	-	187	11	8
Salisbury,	-	1385	5	0
Bangor,	-	131	16	3
Norwich,	-	834	11	7
Gloucester,	-	315	7	3
Landaff,	-	154	14	2
Lincoln,	-	894	18	1
Bristol,	-	294	11	0
Carlisle,	-	531	4	9
Exeter,	-	500	0	0
Peterborough,	-	414	14	8
Oxford,	-	381	11	0
St Davids,	-	426	2	1

The ecclesiastical government of England is, properly speaking, lodged in the convocation; which is a national representative or synod, and answers pretty near to the ideas we have of a parliament. They are convoked at the same time with every parliament; and their business is to consider of the state of the church, and to call those to an account who have advanced new opinions, inconsistent with the doctrines of the church of England. Some high-flying clergymen during the reign of queen Anne, and in the beginning of that of George I. raised the powers of the convocation to a height that was inconsistent with the principles of religious toleration, and indeed of civil liberty: so that the crown was obliged to exert its prerogative of calling the members together, and of dissolving them; and ever since they have not been permitted to sit for any time, in which they could do business.

NEW ENGLAND, late a province of the British empire in America, is bounded on the north by Canada, on the east by Nova Scotia and the Atlantic ocean, on the south by the Atlantic and Long Island Sound, and on the west by New York. It lies in the form of a quarter of a circle. Its west line, beginning at the mouth of Byram river which empties into Long Island Sound at the south-west corner of Connecticut, latitude 41°, runs a little east of north, until

^{New}
England. til it strikes the 45th degree of latitude, and then curves to the eastward almost to the gulph of St Lawrence.

¹
When first discovered. This country was discovered in the beginning of the last century, and called *North Virginia*; but no Europeans settled there till the year 1608. The first colony, which was weak and ill-directed, did not succeed; and, for some time, there were only a few adventurers who came over at times in the summer, built themselves temporary huts for the sake of trading with the savages, and, like them, disappeared again for the rest of the year. At last some Brownists, headed by Mr Robinson, whom Neal styles the Father of the Independents, who in 1610 had been driven from England by persecution, fled to Holland, and settled at Leyden; but in 1621 determined, with Mr Brewster assistant-preacher to Mr Robinson, to found a church for their sect in the new hemisphere. They therefore purchased, in 1521, the charter of the English North Virginia company. Forty-one families, making in all 120 persons, landed in the beginning of a very hard winter, and found a country entirely covered with wood, which offered a very melancholy prospect to men already exhausted with the fatigues of their voyage. Near one half perished either by cold, the scurvy, or other distresses. The courage of the rest was beginning to fail; when it was revived by the arrival of 60 savage warriors, who came to them in the spring, headed by their chief. The old tenants assigned for ever to the new ones all the lands in the neighbourhood of the settlement they had formed, under the name of *New Plymouth*; and one of the savages who understood a little English, staid to teach them how to cultivate the maize, and instruct them in the manner of fishing upon their coast.

This kindness enabled the colony to wait for the companions they expected from Europe with seeds, with domestic animals, and with every assistance they wanted. At first these succours arrived but slowly; but the persecution of the Puritans in England increased the number of profelytes to such a degree in America, that in 1630 they were obliged to form different settlements, of which Boston soon became the principal. These first settlers were not merely ecclesiastics, who had been deprived of their preferments on account of their opinions; nor those sectaries influenced by new opinions, that are so frequent among the common people. There were among them several persons of high rank, who, having embraced Puritanism, had taken the precaution to secure themselves an asylum in these distant regions. They had caused houses to be built, and lands to be cleared, with a view of retiring there, if their endeavours in the cause of civil and religious liberty should prove abortive.

^{Raynal's}
^{History of}
^{European}
^{Settlements.} The inhabitants of New England lived peaceably for a long time, without any regular form of policy. Their charter had indeed authorized them to establish any mode of government they might choose; but these enthusiasts were not agreed among themselves upon the plan of their republic, and government did not pay sufficient attention to them to urge them to secure their own tranquillity. At length they grew sensible of the necessity of a regular legislation; and this great work, which virtue and genius united have never attempted but with diffidence, was boldly undertaken by

blind fanaticism. It bore the stamp of the rude prejudices on which it had been formed. There was in this new code a singular mixture of good and evil, of wisdom and folly. No man was allowed to have a share in the government except he were a member of the established church. Witchcraft, perjury, blasphemy, and adultery, were made capital offences; and children were also punished with death, either for cursing or striking their parents. Marriages, however, were to be solemnized by the magistrate. The price of corn was fixed at 2 s. 11½ d. per bushel. The savages who neglected to cultivate their lands were to be deprived of them; and Europeans were forbidden under a heavy penalty to sell them any strong liquors or warlike stores. All those who were detected either in lying, drunkenness, or dancing, were ordered to be publicly whipped. But at the same time that amusements were forbidden equally with vices and crimes, one might be allowed to swear by paying a penalty of 11½ d. and to break the sabbath for 2 l. 19 s. 9½ d. Another indulgence allowed was, to atone, by a fine, for a neglect of prayer, or for uttering a rash oath. But it is still more extraordinary, that the worship of images were forbidden to the Puritans on pain of death; which was also inflicted on Roman Catholic priests, who should return to the colony after they had been banished; and on Quakers who should appear again after having been whipped, branded, and expelled. Such was the abhorrence for these sectaries, who had themselves an aversion for every kind of cruelty, that whoever either brought one of them into the country, or harboured him but for one hour, was liable to pay a considerable fine.

Those unfortunate members of the colony, who, less violent than their brethren, ventured to deny the coercive power of the magistrate in matters of religion, were persecuted with still greater rigour. This was considered as blasphemy by those very divines who had rather chosen to quit their country than to show any deference to Episcopal authority. This system was supported by the severities of the law, which attempted to put a stop to every difference in opinion, by inflicting capital punishment on all who dissented. Those who were either convicted, or even suspected, of entertaining sentiments of toleration, were exposed to such cruel oppressions, that they were forced to fly from their first asylum, and seek refuge in another. They found one on the same continent; and as New England had been first founded by persecution, its limits were extended by it.

This intemperate religious zeal extended itself to matters in themselves of the greatest indifference. A proof of this is found in the following public declaration, transcribed from the registers of the colony.

"It is a circumstance universally acknowledged, 4.
"that the custom of wearing long hair, after the Law against
"manner of immoral persons and of the savage In- wearing
"dians, can have been introduced into England only long hair.
"in sacrilegious contempt of the express command of
"God, who declares that it is a shameful practice for
"any man who has the least care for his soul to wear
"long hair. As this abomination excites the indig-
"nation of all pious persons; we, the magistrates, in-
"our zeal for the purity of the faith, do expressly
"and authentically declare, that we condemn the im-
"pious.

^{New}
England.
²
First code
of laws.

Quakers
persecuted.

New
England.

“ pious custom of letting the hair grow; a custom
 “ which we look upon to be very indecent and disho-
 “ nest, which horribly disguises men, and is offensive
 “ to modest and sober persons, in as much as it cor-
 “ rupts good manners. We therefore, being justly
 “ incensed against this scandalous custom, do desire,
 “ advise, and earnestly request all the elders of our
 “ continent, zealously to show their aversion for this
 “ odious practice, to exert all their power to put a
 “ stop to it, and especially to take care that the mem-
 “ bers of their churches be not infected with it; in or-
 “ der that those persons who, notwithstanding these
 “ rigorous prohibitions, and the means of correction
 “ that shall be used on this account, shall still persist in
 “ this custom, shall have both God and man at the same
 “ time against them.”

This severity soon exerted itself against the Quakers. They were whipped, banished, and imprisoned. The behaviour of these new enthusiasts, who in the midst of tortures and ignominy praised God, and called for blessings upon men, inspired a reverence for their persons and opinions, and gained them a number of proselytes. This circumstance exasperated their persecutors, and hurried them on to the most atrocious acts of violence; and they caused five of them, who had returned clandestinely from banishment, to be hanged. This spirit of persecution was, however, at last suppressed by the interposition of the mother-country, from whence it had been brought. Charles II. moved with the sufferings of the Quakers, put a stop to them by a proclamation in 1661; but he was never able totally to extinguish the spirit of persecution that prevailed in America.

The colony had placed at their head Henry Vane, the son of that Sir Henry Vane who had such a remarkable share in the disturbances of his country. This obstinate and enthusiastic young man had contrived to revive the questions of grace and free-will. The disputes upon these points ran very high; and would probably have plunged the colony into a civil war, if several of the savage nations united had not happened at that very time to fall upon the plantations of the disputants, and to massacre great numbers of them. The colonists, heated with their theological contests, paid at first very little attention to this considerable loss. But the danger at length became so urgent and so general, that all took up arms. As soon as the enemy was repulsed, the colony resumed its former dissensions; and the phrenzy which they excited broke out in 1692 in a war, marked with as many atrocious instances of violence as any ever recorded in history.

5
Extraordi-
nary perse-
cution of
witches,

There lived in a town of New England, called *Salem*, two young women who were subject to convulsions, accompanied with extraordinary symptoms. Their father, minister of the church, thought that they were bewitched; and having in consequence cast his suspicions upon an Indian girl who lived in his house, he compelled her by harsh treatment to confess that she was a witch. Other women, upon hearing this, immediately believed, that the convulsions, which proceeded only from the nature of their sex, were owing to the same cause. Three citizens, casually named, were immediately thrown into prison, accused of witchcraft, hanged, and their bodies left exposed to wild

beasts and birds of prey. A few days after, 16 other persons, together with a counsellor, who, because he refused to plead against them, was supposed to share in their guilt, suffered in the same manner. From this instant, the imagination of the multitude was inflamed with these horrid and gloomy scenes. Children of ten years of age were put to death, young girls were stripped naked, and the marks of witchcraft searched for upon their bodies with the most indecent curiosity; and those spots of the scurvy which age impresses upon the bodies of old men, were taken for evident signs of the infernal power. In default of these, torments were employed to extort confessions dictated by the executioners themselves. If the magistrates, tired out with executions, refused to punish, they were themselves accused of the crimes they tolerated; the very ministers of religion raised false witnesses against them, who made them forfeit with their lives the tardy remorse excited in them by humanity. Dreams, apparitions, terror, and consternation of every kind, increased these prodigies of folly and horror. The prisons were filled, the gibbets left standing, and all the citizens involved in gloomy apprehensions. The most prudent quitted the country stained with the blood of its inhabitants; and nothing less than the total and immediate subversion of the colony was expected, when, on a sudden, all eyes were opened at once, and the excess of the evil awakened the minds which it had first stupified. Bitter and painful remorse was the immediate consequence; the mercy of God was implored by a general fast, and public prayers were offered up to ask forgiveness for the presumption of having supposed that heaven could have been pleased with sacrifices with which it could only have been offended.

Posterity will, probably, never know exactly what was the cause or remedy of this dreadful disorder. It had, perhaps, its first origin in the melancholy which those persecuted enthusiasts had brought with them from their own country, which had increased with the scurvy they had contracted at sea, and had gathered fresh strength from the inconveniences and hardships inseparable from a change of climate and manner of living. The contagion, however, ceased like all other epidemical distempers, exhausted by its very communication. A perfect calm succeeded this agitation; and the Puritans of New England have never since been seized with so gloomy a fit of enthusiasm.

But though the colony has renounced the persecuting spirit which hath stained all religious sects with blood, it has preserved some remains, if not of intolerance, at least of severity, which remind us of those melancholy days in which it took its rise. Some of its laws are still too severe.

New England had, however, some remedy against bad laws, in the constitution of its mother-country, where the people who have the legislative power in their own hands are at liberty to correct abuses; and it has others derived from its situation, which open a vast field to industry and population.

The clearing of the lands in this colony is not directed by chance as in the other provinces. This matter from the first was subjected to laws which are still religiously observed. No citizen whatever has the liberty of settling even upon unoccupied land. The government, desirous of preserving all its members from

New
England.

6
Manner of
settlement
in this co-
lony.

New
England

the inroads of the savages, and of placing them in a condition to share in the protection of a well-regulated society, hath ordered that whole villages should be formed at once. As soon as 60 families offer to build a church, maintain a clergyman, and pay a school-master, the general assembly allot them a situation, and permit them to have two representatives in the legislative body of the colony. The district assigned them always borders upon the lands already cleared, and generally contains 60,000 square acres. These new people choose the situation most convenient for their habitation, which is usually of a square figure. The church is placed in the centre; the colonists divide the land among themselves, and each incloses his property with a hedge. Some woods are reserved for a common; and thus New England is constantly enlarging its territory, though it still continues to make one complete and well constituted province.

7
Division,
&c.

The country was divided into four states, which at first had no connection with one another. The necessity of maintaining an armed force against the savages, obliged them to form a confederacy in 1643, when they took the name of the *United Colonies*. In consequence of this league, two deputies from each establishment used to meet in a stated place to deliberate upon the common affairs of New England, according to the instructions they had received from the assembly by which they were sent. This association laid no constraint upon the right of every individual to act entirely as he pleased, without either the permission or approbation of the mother-country. All the submission required of these provinces was merely to acknowledge the kings of England for their sovereigns. Charles II. wished to make them more dependent. The province of Massachusetts bay, which, though the smallest, was the richest and the most populous of the four, being guilty of some misdemeanour against government, the king seized that opportunity of taking away its charter in 1684: and it remained without one till the revolution; when it received another, which, however, did not answer its claims or expectations. The crown reserved to itself the right of nominating the governor, and appointing to all military employments, and to all principal posts in the civil and juridical departments: it allowed the people of the colony their legislative power, and gave the governor a negative voice and the command of the troops, which secured him a sufficient influence to enable him to maintain the prerogative of the mother-country in all its force. The provinces of Connecticut and Rhode-Island, by timely submission, prevented the punishment which that of Massachusetts had incurred, and retained their original charter. That of New-Hampshire had been always regulated by the same mode of administration as the province of Massachusetts bay. The same governor presided over the whole colony, but with regulations adapted to the constitution of each province. To the above states, another has been added since the late revolution, *viz.* VERMONT. These states are subdivided into counties, and the counties into townships.

8
Face of the
country,
mountains,
&c.

New England is a high, hilly, and in some parts a mountainous country, formed by nature to be inhabited by a hardy race of free, independent republicans. —The mountains are comparatively small, running nearly north and south in ridges parallel to each other.

New
England.

Between these ridges flow the great rivers in majestic meanders, receiving the innumerable rivulets and larger streams which proceed from the mountains on each side. To a spectator on the top of a neighbouring mountain, the vales between the ridges, while in a state of nature, exhibit a romantic appearance. They seem an ocean of woods, swelled and depressed in its surface like that of the great ocean itself. A richer though less romantic view is presented, when the valleys, by industrious husbandmen, have been cleared of their natural growth; and the fruit of their labour appears in loaded orchards, extensive meadows, covered with large herds of sheep and neat cattle, and rich fields of flax, corn, and the various kinds of grain. These valleys, which have received the expressive name of *interval lands*, are of various breadths, from 2 to 20 miles; and by the annual inundations of the rivers which flow through them, there is frequently an accumulation of rich, fat soil, left upon their surface when the waters retire.

There are four principal ranges of mountains, passing nearly from north-east to south-west through New-England. These consist of a multitude of parallel ridges, each having many spurs, deviating from the course of the general range; which spurs are again broken into irregular hilly land. The main ridges terminate, sometimes in high bluff heads, near the sea-coast, and sometimes by a gradual descent in the interior part of the country. One of the main ranges runs between Connecticut and Hudson's rivers. This range branches and bounds the vales through which flows the Housatonic river. The most eastern ridge of this range terminates in a bluff head at Meriden; a second ends in like manner at Willingford, and a third at New Haven. In Lyme, on the east side of Connecticut river, another range of mountains commences, forming the eastern boundary of Connecticut vale. This range trends northerly, at the distance, generally, of about 10 or 12 miles east from the river, and passes through Massachusetts, where the range takes the name of *Chickabee Mountain*; thence crossing into New Hampshire, at the distance of about 20 miles from the Massachusetts line, it runs up into a very high peak, called *Monadnick*, which terminates this ridge of the range. A western ridge continues, and in about latitude $43^{\circ} 20'$ runs up into Sunipsee mountains. About 50 miles further, in the same ridge, is Mooscoog mountain. A third range begins near Stonington in Connecticut. It takes its course north-easterly, and is sometimes broken and discontinued; it then rises again, and ranges in the same direction into New Hampshire, where, in latitude $43^{\circ} 25'$, it runs up into a high peak called *Cowfawaskog*. The fourth range has a humble beginning about Hopkinton in Massachusetts. The eastern ridge of this range runs north by Watertown and Concord, and crosses Merrimack river at Pantucket Falls. In New Hampshire, it rises into several high peaks, of which the White mountains is the principal. From these White mountains a range continues north east, crossing the east boundary of New Hampshire, in latitude $44^{\circ} 30'$, and forms the height of land between Kennebek and Chaudiere rivers. These ranges of mountains are full of lakes, ponds, and springs of water, that give rise to numberless streams of various sizes, which, interlocking

New
England.

ing each other in every direction, and falling over the rocks in romantic cascades, flow meandering into the rivers below. No country on the globe is better watered than New England.

On the sea-coast the land is low, and in many parts level and sandy. In the valleys, between the forementioned ranges of mountains, the land is generally broken, and in many places rocky, but of a strong rich soil, capable of being cultivated to good advantage, which also is the case with many spots even on the tops of the mountains.

The principal river in New England is Connecticut. See CONNECTICUT.

9
Soil, pro-
ductions,
&c.

The soil, as may be collected from what has been said, must be very various. Each tract of different soil is distinguished by its peculiar vegetation, and is pronounced good, middling, or bad, from the species of trees which it produces; and from one species generally predominating in each soil, has originated the descriptive names of oak land, birch, beech, and chestnut lands, pine, barren, maple, ash, and cedar swamps, as each species happens to predominate. Intermingled with those predominating species are walnut, firs, elm, hemlock, magnolia, moose wood, sassafras, &c. &c. The best lands produce walnut and chestnut; the next, beech and oak; lands of the third quality produce fir and pitch pine; the next, whortleberry and barberry bushes; and the poorest produce nothing but marshy imperfect shrubs. Among the flowering trees and shrubs in the forests, are the red-flowering maple, the sassafras, the locust-tree, the tulip-tree, honeysuckle, wild rose, dogwood, elm, leather-tree, laurel, hawthorn, &c. which in the spring of the year give the woods a most beautiful appearance, and fill them with a delicious fragrance. Among the fruits which grow wild, are the several kinds of grapes; which are small, sour, and thick skinned. The vines on which they grow are very luxuriant, often overspreading the highest trees in the forests; and without doubt, might be greatly meliorated by proper cultivation. Besides these, are the wild cherries, white and red mulberries, cranberries, walnuts, hazelnuts, chestnuts, butter nuts, beech nuts, wild plums and pears, whortle-berries, bilberries, gooseberries, strawberries, &c.

The soil in the interior country is calculated for the culture of Indian corn, rye, oats, barely, flax, and hemp (for which the soil and climate are peculiarly proper), buck-wheat, beans, peas, &c. In many of the inland parts wheat is raised in large quantities; but on the sea-coast it has never been cultivated with success, being subject to blasts. The fruits which the country yields from culture, are, apples in the greatest plenty; of these cyder is made, which constitutes the principal drink of the inhabitants; also, pears of various sorts, quinces, peaches (from which is made peach brandy,) plums, cherries, apricots, &c. The culinary plants are such as have already been enumerated. New England is a fine grazing country; the valleys between the hills are generally intersected with brooks of water, the banks of which are lined with a tract of rich meadow or interval land. The high and rocky ground is, in many parts, covered with honeysuckle, and generally affords the finest of pasture. It will not be a matter of wonder, therefore, that New England boasts of raising some of the finest cattle in the world; nor will

N^o 117.

she be envied, when the labour of raising them is taken into view. Two months of the hottest season in the year the farmers are employed in procuring food for their cattle; and the cold winter is spent in dealing it out to them. The pleasure and profit of doing this, is however a satisfying compensation to the honest and industrious farmer.

New England is the most populous part of the United States. It contains at least 823,000 souls. One fifth of these are fencible men. New England then, should any great and sudden emergency require it, could furnish an army of 164,600 men. The great body of these are land-holders and cultivators of the soil. The former attaches them to their country; the latter, by making them strong and healthy, enables them to defend it. The boys are early taught the use of arms, and make the best of soldiers. Few countries on earth, of equal extent and population, can furnish a more formidable army than this part of the union.

New England may, with propriety, be called a nursery of men, whence are annually transplanted, into other parts of the United States, thousands of its natives. The State of Vermont, which is but of yesterday, and contains about 100,000 souls, has received more inhabitants from Connecticut than from any other state; and yet between the years 1774 and 1782, notwithstanding her numerous emigrations to Vermont, Susquehannah, and other places, and the depopulation occasioned by a seven years bloody war, it is found, from an actual census of the inhabitants in the years before-mentioned, that they have increased from 197,856, their number in 1774, to 290,150, their number in 1782. Vast numbers of the New Englanders, since the war, have emigrated into the northern parts of New York, into Kentucky and the Western Territory, and into Georgia; and some are scattered into every State, and every town of note in the union.

The New Englanders are generally tall, stout, and well built. They glory, and perhaps with justice, in possessing that spirit of freedom which induced their ancestors to leave their native country, and to brave the dangers of the ocean and the hardships of settling a wilderness. Their education, laws, and situation, serve to inspire them with high notions of liberty. Their jealousy is awakened at the first notion toward an invasion of their rights. They are indeed often jealous to excess; a circumstance which is a fruitful source of imaginary grievances, and of innumerable groundless suspicions and unjust complaints against government. A law, respecting the descent of estates which are generally held in fee simple, which for substance is the same in all the New England states, is the chief foundation and protection of this liberty. By this law, the possessions of the father are to be equally divided among all the children, excepting the eldest son, who has a double portion. In this way is preserved that happy mediocrity among the people, which, by inducing economy and industry, removes from them temptations to luxury, and forms them to habits of sobriety and temperance. At the same time, their industry and frugality exempt them from want, and from the necessity of submitting to any encroachment on their liberties.

In New England, learning is more generally diffused among all ranks of people than in almost any other

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Population,
manners,
customs,
and diver-
sions.

New
England.

other part of the globe; arising from the excellent establishment of schools in every township. Another source of information to the people is the newspapers, of which not less than 30,000 are printed every week in New England, and circulated in almost every town and village in the country. A person of mature age, who cannot both read and write, is rarely to be found. By means of this general establishment of schools, the extensive circulation of newspapers, and the consequent spread of learning, every township throughout the country is furnished with men capable of conducting the affairs of their town with judgment and discretion. These men are the channels of political information to the lower class of people; if such a class may be said to exist in New England, where every man thinks himself at least as good as his neighbour, and believes that all mankind are, or ought to be, equal. The people from their childhood form habits of canvassing public affairs, and commence politicians. This naturally leads them to be very inquisitive. This desire after knowledge, in a greater or less degree, prevails throughout all classes of people in New England: and from their various modes of expressing it, some of which are blunt and familiar, bordering on impertinence, strangers have been induced to mention impertinent inquisitiveness as a distinguishing characteristic of New England people.—Each man also has his independent system of politics; and each assumes a dictatorial office. Hence originates that restless, litigious, complaining spirit, which forms a dark shade in the character of New Englandmen.

Before the late war, which introduced into New England a flood of corruptions, with many improvements, the Sabbath was observed with great strictness; no unnecessary travelling, no secular business, no visiting, no diversions were permitted on that sacred day. They considered it as consecrated to divine worship, and were generally punctual and serious in their attendance upon it. Their laws were strict in guarding the Sabbath against every innovation. The supposed severity with which these laws were composed and executed, together with some other traits in their religious character, have acquired, for the New Englanders, the name of a superstitious bigotted people. But superstition and bigotry are so indefinite in their significations, and so variously applied by persons of different principles and educations, that it is not easy to determine how far they deserved that character. Leaving every person to enjoy his own opinion in regard to this matter, we will only observe, that, since the war, a catholic tolerant spirit, occasioned by a more enlarged intercourse with mankind, has greatly increased, and is becoming universal; and if they do not break the proper bound, and liberalize away all true religion, of which there is much danger, they will counteract that strong propensity in human nature, which leads men to vibrate from one extreme to its opposite.

There is one distinguishing characteristic in the religious character of this people, which we must not omit to mention; and that is, the custom of annually celebrating fasts and thanksgivings. In the spring, the several governors issue their proclamations, appointing a day to be religiously observed in fasting, humiliation, and prayer, throughout their respective states, in which the predominating vices, that particularly call for hu-

miliation, are enumerated. In autumn, after harvest, that gladsome era in the husbandman's life, the governors again issue their proclamations appointing a day of public thanksgiving, enumerating the public blessings received in the course of the foregoing year. This pious custom originated with their venerable ancestors, the first settlers of New England; and has been handed down as sacred through the successive generations of their posterity. A custom so rational, and so happily calculated to cherish in the minds of the people a sense of their dependence on the great Benefactor of the world for all their blessings, it is hoped will ever be sacredly preserved.

The people of New England generally obtain their estates by hard and persevering labour: They of consequence know their value, and spend with frugality. Yet in no country do the indigent and unfortunate fare better. Their laws oblige every town to provide a competent maintenance for their poor; and the necessitous stranger is protected and relieved from their humane institutions. It may in truth be said, that in no part of the world are the people happier, better furnished with the necessaries and conveniences of life, or more independent than the farmers in New England. As the great body of the people are hardy independent freeholders, their manners are, as they ought to be, congenial to their employment, plain, simple, and unpolished. Strangers are received and entertained among them with a great deal of artless sincerity and friendly informal hospitality. Their children, those imitative creatures, to whose education particular attention is paid, early imbibe the manners and habits of those around them; and the stranger, with pleasure, notices the honest and decent respect that is paid him by the children as he passes through the country.

As the people, by representation, make their own laws and appoint their own officers, they cannot be oppressed; and living under governments which have few lucrative places, they have few motives to bribery, corrupt canvassings, or intrigue. Real abilities and a moral character unblemished are the qualifications requisite in the view of most people for offices of public trust. The expression of a wish to be promoted is the direct way to be disappointed.

The inhabitants of New England are generally fond of the arts, and have cultivated them with great success. Their colleges have flourished beyond any others in the United States. The illustrious characters they have produced, who have distinguished themselves in politics, law, divinity, the mathematics and philosophy, natural and civil history, and in the fine arts, particularly in poetry, evince the truth of these observations.

Many of the women in New England are handsome. They generally have fair, fresh, and healthful countenances, mingled with much female softness and delicacy. Those who have had the advantages of a good education (and they are considerably numerous), are genteel, easy, and agreeable in their manners, and are sprightly and sensible in conversation. They are early taught to manage domestic concerns with neatness and economy. Ladies of the first rank and fortune make it a part of their daily business to superintend the affairs of the family. Employment at the needle, in cookery, and at the spinning-wheel, with them is honourable. Idleness, even in those of independent for-

New
England.

New
England,
English.

tunes, is universally disreputable. The women in the country manufacture the greatest part of the clothing of their families. Their linen and woollen cloths are strong and decent. Their butter and cheese is not inferior to any in the world.

Dancing is the principal and favourite amusement in New England; and of this the young people of both sexes are extremely fond. Gaming is practised by none but those who cannot or rather will not find a reputable employment. The gamester, the horse-jockey, and the knave, are equally despised, and their company is avoided by all who would sustain fair and irreproachable characters. The odious and inhuman practices of duelling, gouging, cock-fighting, and horse-racing, are scarcely known here.—The athletic and healthy diversions of cricket, football, quoits, wrestling, jumping, foot-races, &c. are universally practised in the country, and some of them in the most populous places, and by people of almost all ranks. Squirrel-hunting is a noted diversion in country places, where this kind of game is plenty. Some divert themselves with fox-hunting, and others with the more profitable sports of fishing and duck-hunting; and in the frontier settlements where deer and fur game abound, the inhabitants make a lucrative sport of hunting them. In the winter season, while the ground is covered with snow, which is commonly two or three months, sleighing is the general diversion. A great part of the families throughout the country are furnished with horses and sleighs.

Trade.

New England has no one staple commodity. The ocean and the forests afford the two principal articles of export. Codfish, mackarel, shad, salmon, and other fish—whale oil and whale bone—masts, boards, scantling, staves, hoops, and shingles, have been and are still exported in large quantities. The annual amount of cod and other fish for foreign exportation, including the profits arising from the whale-fishery, is estimated at upwards of half a million.—Besides the articles enumerated, they export from the various parts of New England ships built for sale, horses, mules, live stock—pickled beef and pork, potash, pearl-ash, flax, seed, butter and cheese, rum, &c. The balance of trade, as far as imperfect calculations will enable us to judge, has generally been against New England; not from any unavoidable necessity, but from her extravagant importations. From a view of the annual imports into New England, it appears that the greatest part of them consists of the luxuries, or at best the dispensable conveniences of life; the country affords the necessaries in great abundance.

ENGLISH, or the *ENGLISH Tongue*, the language spoken by the people of England, and, with some variation, by those of Scotland, as well as part of Ireland, and the rest of the British dominions.

The ancient language of Britain is generally allowed to have been the same with the Gallic, or French; this island, in all probability, having been first peopled from Gallia, as both Cæsar and Tacitus affirm, and prove by many strong and conclusive arguments, as by their religion, manners, customs, and the nearness of their situation. But now we have very small remains of the ancient British tongue, except in Wales, Cornwall, the islands and Highlands of Scotland, part of

Ireland, and some provinces of France; which will not appear strange, when what follows is considered.

Julius Cæsar, some time before the birth of our Saviour, made a descent upon Britain, though he may be said rather to have discovered than conquered it; but about the year of Christ 45, in the time of Claudius, Aulus Plautius was sent over with some Roman forces, by whom two kings of the Britons, Togodumnus and Caradacus, were both overcome in battle: whereupon a Roman colony was planted at Malden in Essex, and the southern parts of the island were reduced to the form of a Roman province: after that, the island was conquered as far north as the friths of Dunbarton and Edinburgh, by Agricola, in the time of Domitian; whereupon a great number of the Britons, in the conquered part of the island, retired to the west part called *Wales*, carrying their language with them.

The greatest part of Britain being thus become a Roman province, the Roman legions, who resided in Britain for above 200 years, undoubtedly disseminated the Latin tongue; and the people being afterwards governed by laws written in Latin, must necessarily make a mixture of languages. This seems to have been the first mutation the language of Britain suffered.

Thus the British tongue continued, for some time, mixed with the provincial Latin, till, the Roman legions being called home, the Scots and Picts took the opportunity to attack and harass England: upon which, K. Vortigern, about the year 440, called the Saxons to his assistance; who came over with several of their neighbours, and having repulsed the Scots and Picts, were rewarded for their services with the isle of Thanet and the whole county of Kent; but growing too powerful, and not being contented with their allotment, dispossessed the inhabitants of all the country on this side of the Severn*: thus the British tongue was in a great measure destroyed, and the Saxon introduced in its stead.

See Eng-
land. n^o 13.
—42.

What the Saxon tongue was long before the conquest, about the year 700, we may observe in the most ancient manuscript of that language, which is a gloss on the Evangelists, by bishop Edfrid, in which the three first articles of the Lord's prayer run thus:

"Uren fader thic arth in heofnas, sic gehalgud thin noma, so cymeth thin ric. Sic thin willa sue is heofnas, and in eorþo," &c.

In the beginning of the ninth century the Danes invaded England; and getting a footing in the northern and eastern parts of the country, their power gradually increased, and they became sole masters of it in about 200 years. By this means the ancient British obtained a tincture of the Danish language; but their government being of no long continuance, did not make so great an alteration in the Anglo-Saxon as the next revolution, when the whole land, A. D. 1067, was subdued by William the conqueror, Duke of Normandy in France: for the Normans, as a monument of their conquest, endeavoured to make their language as generally received as their commands, and thereby rendered the British language an entire medley.

About the year 900, the Lord's prayer, in the ancient Anglo-Saxon, ran thus:

"Thue ur fader the eart on heofenum, si thin nama gehalgod;

Englith. gehalgot; cume thin rice si thin willa on eorthan swa, two on heofenum," &c.

About the year 1160, under Henry II. it was rendered thus by Pope Adrian, an Englishman, in rhyme:

"Ure fader in heaven rich,
"Thy name be halyed ever lich,
"Thou bring us thy michel blisse:
"Als hit in heaven y doe,
"Evar in yearth been it also," &c.

Dr Hicks gives us an extraordinary specimen of the English, as spoken in the year 1385, upon the very subject of the English tongue.

"As it is knowe how meny maner peple beeth in this lond; ther beeth also so many dyvers longages and tonges. Notheles Walschemen and Scots that beeth nought medled with other nation, holdeth wel nyh hir firste longage and speche; but yif the Scottes, that were sometime confederate and woned with the Pictes, drawe somewhat after hir speche; but the Flemynge, that woneth on the west side of Wales, haveth lost hir strange spech, and speketh Saxonliche now. Also Englishmen, they had from the bygynnyng thre maner speche; northerne, southerne, and middel speche in the middel of the lond, as they come of thre maner of peple of Germania: notheles by comyxtion and mellyng first with Danes, and afterwards with Normans, in meny the contrary longage is apayred (*corrupted.*)

"This apayryng of the burth of the tunge is bycause of tweie things; oon is for children in scole agenst the usuage and maner of all other nations, beeth compelled for to leve hir own longage, and for to construe hir lessons and here thinges in Frensche, and so they haveth sethe Normans come first into Engeland. Also gentlemen children beeth taught to speke Frensche from the tyme that they beeth roked in here cradel, and kunneth speke and play with a childe's broche; and uplondische men will lykne hymself to gentilmen, and fondeth with great besynesse for to speak Frensche to be told of.—Hit seemeth a greet wonder how Englishmen and hir own longage and tonge is so dyverse of fown in this oon iland: and the longage of Normandie is comlyng of another lond, and hath oon maner foun amonge alle men that speketh hit arigt in Engeland. Also of the foresaid Saxon tonge that is deled (*divided*) a three, and is abide scarceliche with fewe uplondische men, is greet wonder. For men of the est, with men of the west, is, as it were, undir the same partie of hevene accordeth more in fownyng of speche, than men of the north with men of the south. Therefore it is that Mercii, that beeth men of myddel Engeland, as it were, parteners of the endes, understondeth better the fide longes northerne and southerne, than northerne and southerne understondeth either other.—All the longage of the Northumbers and spechialliche at York, is so scharp, slitting and frotynge, and unschape, that we southerne men may that longage unnethe understonde," &c.

In the year 1537, the Lord's prayer was printed as follows: "O oure father which arte in heven, hallowed be thy name: let thy kingdome come, thy will be fulfilled as well in erth as it is in heven; geve us this daye in dayly bred," &c. Where it may be observed, that the diction is brought almost to the present standard, the chief variations being only in the orthography.

By these instances, and many others that might be given, it appears, that the English Saxon language, of which the Normans despoiled us in a great measure, had its beauties, was significant and emphatical, and preferable to what they imposed on us. "Great, verily (says Camden), was the glory of our tongue before the Norman conquest, in this, that the old English could expresse most aptly, all the conceptions of the mind in their own tongue, without borrowing from any." Of this he gives several examples.

Having thus shown how the ancient British language was in a manner extirpated by the Romans, Danes, and Saxons, and succeeded by the Saxon, and after that the Saxon blended with the Norman French, we shall now mention two other causes of change in the language. The first of these is owing to the Britons having been a long time a trading nation, whereby offices, dignities, names of wares, and terms of traffic, are introduced, which we take with the wares from the persons of whom we have them, and form them anew, according to the genius of our own tongue; and besides this change in the language, arising from commerce, Britain's having been a considerable time subject to the see of Rome, in ecclesiastical affairs, must unavoidably have introduced some Italian words among us. Secondly, As to the particular properties of a language, our tongue has undergone no small mutation, or rather has received no small improvement upon that account: for, as to the Greek and Latin, the learned have, together with the arts and sciences now rendered familiar among us, introduced abundance; nay, almost all the terms of art in the mathematics, philosophy, physic, and anatomy; and we have entertained many more from the Latin, French, &c. for the sake of neatness and elegancy; so that, at this day, our language, which, about 1800 years ago, was the ancient British, or Welsh, &c. is now a mixture of Saxon, Teutonic, Dutch, Danish, Norman, and modern French, embellished with the Greek and Latin. Yet this, in the opinion of some, is so far from being a disadvantage to the English tongue as now spoken (for all languages have undergone changes, and do continually participate with each other), that it has so enriched it, as now to render it the most copious, significant, fluent, courteous, and masculine language in Europe, if not in the world.

ENGRAFTING, in gardening. See GRAFTING.

ENGRAILED, or INGRAILED, in heraldry, a term derived from the French *greffy*, "hail;" and signifying a thing the hail has fallen upon and broke off the edges, leaving them ragged, or with half-rounds, or semicircles, struck out of their edges.

ENGRAVING, the art of cutting metals and precious stones, and representing thereon figures, letters, or whatever device or design the artist fancies.

Engraving, properly a branch of sculpture, is divided into several other branches, according to the matter whereon it is employed, and the manner of performing it. For the rudest branch, that of

ENGRAVING ON Wood. See CUTTING in Wood.

ENGRAVING ON Copper, the making, correspondently to some delineated figure or design, such concave lines on a smooth surface of copper, either by cutting or corrosion, as render it capable, when charged properly with any coloured fluid, of imparting by compression

Engraving. an exact representation of the figure or design to paper or parchment.

† See Po-
lite ARTS,
n^o 13.

Whether we consider the art of engraving, with regard to the utility and pleasure it affords, or the difficulty that attends its execution, we cannot but confess, that on every account it deserves a distinguished rank among the polite arts †. It is by means of this art that the cabinets of the curious are adorned with the portraits of the greatest men of all ages and all nations; that their memories, their most remarkable and most glorious actions, are transmitted to the latest posterity. It is by this art also, that the paintings of the greatest masters are multiplied to a boundless number; and that the lovers of the polite arts, diffused over the face of the whole earth, are enabled to enjoy those beauties from which their distant situations seemed to have for ever debarred them; and persons of moderate fortune are hereby enabled to become possessed of all the spirit, and all the poetry, that are contained in those miracles of art, which seemed to have been reserved for the temples of Italy, or the cabinets of princes. When we reflect, moreover, that the engraver, beside the beauties of poetic composition, and the artful ordinance of design, is to express, merely by the means of light and shade, all the various tints of colours and clear obscure; to give a relief to each figure, and a truth to each object; that he is now to paint a sky serene and bright, and then loaded with dark clouds; now the pure tranquil stream, and then the foaming, raging sea; that here he is to express the character of the man, strongly marked in his countenance, and there the minutest ornament of his dress; in a word, that he is to represent all even the most difficult objects in nature; we cannot sufficiently admire the vast improvements in this art, and that degree of perfection to which it is at this day arrived. See the article PRINTS.

Engraving is an art, for the greatest part, of modern invention; having its rise no earlier than the middle of the 15th century. The ancients, it is true, practised engraving on precious stones and crystals with very good success; and there are still many of their works remaining equal to any production of the later ages. But the art of engraving on plates and blocks of wood, to afford prints or impressions, was not known till after the invention of painting in oil.

The different modes of engraving are the following:

In strokes cut through a thin wax, laid upon the copper, with a point, and these strokes bitten or corroded into the copper with aquafortis. This is called *etching*.

In strokes with the graver alone, unassisted by aquafortis. In this instance, the design is traced with a sharp tool, called a *dry point*, upon the plate; and the strokes are cut or ploughed upon the copper with an instrument distinguished by the name of a *graver*.

In strokes first etched and afterwards finished with the graver: by this expedient the two former methods are united.

In dots without strokes, which are executed with the point upon the wax or ground, bitten in with the aquafortis, and afterwards harmonized with the graver, by the means of which instrument small dots are made; or with the graver alone, as in the flesh and finer parts, unassisted with the point.

In dots first etched and afterwards harmonized with

the dry point, performed by a little hammer called *Engraving opus mallei*, or *the work of the hammer*, as practised by Lutma and others.

In mezzotinto, which is performed by a dark bar or ground being raised uniformly upon the plate with a toothed tool. The design being traced upon the plate, the light parts are scraped off by instruments for that purpose, in proportion as the effect requires.

In aquatinta, a newly invented method of engraving. The outline is first etched, and afterwards a sort of wash is laid by the aquafortis upon the plate, resembling drawings in Indian ink, bitter, &c.

On wood, performed with a single block, on which the design is traced with a pen, and those parts which should be white carefully hollowed out; and this block is afterwards printed by the letter-press printers, in the same manner as they print a book.

On wood, performed with two, three, or more blocks; the first having the outlines cut upon it; the second is reserved for the darker shadows; and the third for the shadows which terminate upon the lights; and these are substituted in their turn, each print receiving an impression from every block. This mode of engraving is called *chiaro-scuro*, and was designed to represent the drawings of the old masters.

On wood and on copper: in these the outline is engraved in a bold dark style upon the copper; and two or more blocks of wood are substituted to produce the darker and lighter shadows, as before.

Of all these modes of engraving, the most ancient is that on *wood*; or, to speak more properly, the first impressions on paper were taken from carved wooden blocks. For this invention it appears that we are indebted to the brief-malers or makers of playing-cards, who practised the art in Germany about the beginning of the 15th century. From the same source may perhaps be traced the first idea of moveable types, which appeared not many years after; for these brief-malers did not entirely confine themselves to the printing and painting of cards, but produced also subjects of a more devout nature; many of which, taken from holy writ, are still preserved in different libraries in Germany, with the explanatory text facing the figures; the whole engraved in wood. In this manner they even formed a species of books; such as, *Historia sancti Johannis, ejusque Visiones Apocalypticae; Historia Veteris & Novi Testamenti*, known by the name of the *Poor Man's Bible*. These short mementos were printed only on one side; and two of them being pasted together, had the appearance of a single leaf. The earliest date on any of these wooden cuts is 1423. The subject is *St Christopher carrying the Infant Jesus over the Sea*, preserved in a convent at Buxheim near Menningen. It is of a folio size, illuminated in the same manner as the playing cards; and at the bottom is this inscription, *Cristoferi faciem die quacunque tueris. Illa nempe die morte mala non morieris. Millesimo CCCC^o XX^o tertio*.

Upon the invention of moveable types, that branch of the brief-malers business, so far as it regarded the making of books, was gradually discontinued; but the art itself of engraving on wood continued in an improving state; and towards the end of the 15th and beginning of the 16th century, it became customary for almost every one of the German engravers on copper.

Engraving. copper to engrave on wood also. The works of Albert Durer in this style of engraving are justly held in the highest esteem. Italy, France, and Holland, have produced many capital artists of this kind; but for boldness and spirit, we must see the prints of Christopher Jegher, who worked under the direction of Rubens, and was without doubt assisted by that great master.

The invention of that species of engraving distinguished by the appellation of *chiaro-scuro*, seems also to be justly claimed by the Germans, and first practised by Mair; one of whose prints of this kind is dated 1499. Many excellent works in *chiaro-scuro* have been produced in France; and in Italy it was honoured with the performances of Titian and Parmegiano; but the attempts of Jackson, Kirkall, and others in England, have not been equally successful. A set of excellent prints in this way have lately been published by J. Skippe, Esq; a connoisseur and dilettante.

In Germany, about the year 1450, prints from engraved copper first made their appearance. The earliest date of a copperplate print is indeed only 1461; but however faulty this print may be with respect to the drawing, or defective in point of taste, the mechanical part of the execution of it has by no means the appearance of being one of the first productions of the graver. We have also several other engravings, evidently the work of the same master; in which the impressions are so neatly taken from the plates, and the engravings so clearly printed in every part, that, according to all appearance, they could not be executed in a much better manner in the present day, with all the conveniences which the copperplate printers now possess, and the additional knowledge they must necessarily have acquired in the course of more than three centuries. Hence we may fairly conclude, that if they were not the first specimens of the engravers workmanship, they were much less the first efforts of the copperplate printer's ability. It is likewise to be observed, that Martin Schoen, who is said, with great appearance of truth, to have worked from 1460 to 1486, was apparently the scholar of Stoltzhirs; for he followed his style of engraving, and copied from him a set of prints, representing the passion of our Saviour. Now, allowing Stoltzhirs to have preceded his disciple only ten years, this carries the era of the art back to 1450, as was said above. There is no ground to suppose that it was known to the Italians till at least ten years afterwards. The earliest prints that are known to be theirs are a set of the seven planets, and an almanack by way of frontispiece; on which are directions for finding Easter from the year 1465 to 1517 inclusive: and we may be well assured, that the engravings were not antedated, for the almanack of course became less and less valuable every year. In all probability, therefore, these prints must have been executed in the year 1464, which is only four years later than the Italians themselves lay any claim to. The three earliest Italian engravers are, Finiguerra, Boticelli, and Baldini. If we are to refer these prints to any of the three, we shall naturally conclude them to be the work of Finiguerra or Baldini; for they are not equal either in drawing or composition to those ascribed to Boticelli, which we know at least were designed by him; and as Baldini is expressly said to have worked from the de-

signs of Boticelli, it will appear most probable that they belong to Finiguerra.

With respect to the invention of *etching*, it seems to be not well known to whom it is to be ascribed. One of the most early specimens is that print by Albert Durer, known by the name of the *Cannon*, dated 1518, and thought by some, with little foundation, to have been worked on a plate of iron. Another etching by the same artist is Moses receiving the Tables of the Law, dated 1524. It was also practised in Italy soon after this by Parmegiano, in whose etchings we discover the hand of the artist working out a system as it were from his own imagination, and striving to produce the forms he wanted to express. We see the difficulty he laboured under; and cannot doubt, from the examination of the mechanical part of the execution of his works, that he had no instruction; and that it was something entirely new to him. If the story is true, that he kept an engraver by profession in his house, the novelty of the art is rendered so much the more probable. He died in 1540.

As to that species of engraving in which the modes of *etching* and *cutting* with the graver are united, it must have been found necessary immediately upon the invention of etching; it was, however, first carried to perfection by G. Audran, and is now almost universally practised, whether the work is in strokes or in dots.

Engraving in *dots*, the present fashionable method, is a very old invention, and the only mode discovered by the Italians. Agostino de Musis, commonly called *Augustine of Venice*, a pupil of Marc Antonio, used it in several of his earliest works, but confined it to the flesh, as in the undated print of An Old Man seated upon a Bank, with a Cottage in the back ground. He flourished from 1509 to 1536. We also find it in a print of "A single Figure standing, holding a Cup and looking upwards," by Giulio Campagnola, who engraved about the year 1516. The back ground is executed with round dots, made apparently with a dry point. The figure is outlined with a stroke deeply engraved, and finished with dots, in a manner greatly resembling those prints which Demarteau engraved at Paris in imitation of red chalk. The hair and beard are expressed by strokes. Stephen de Laulne, a native of Germany, followed the steps of Campagnola; and many of his slight works are executed in dots only. John Boulanger, a French artist, who flourished in the middle of the last century, and his contemporary Nicholas Van Plattenberg, improved greatly on this method, and practised it with much success. It is only, however, of late, that it has been considered as an object worthy of general imitation. John Lutma executed this kind of work with a hammer and a small punch or chissel.

The method of engraving in *mezzotinto* was invented about the middle of the 17th century; and the invention has generally been attributed to Prince Rupert, though it has also been asserted that he learnt the secret from another. See MEZZOTINTO.

Engraving in *aquatinta* is quite a recent invention, and seems at once to have been carried to perfection by Sandby and other living artists. See AQUATINTA.

En.

Engraving.

Engraving with the tool was the kind originally practised, and it is yet retained for many purposes. For though the manœuvre of etching be more easy, and other advantages attend it; yet where great regularity and exactness of the stroke or lines are required, the working with the graver is much more effectual: on which account it is more suitable to the precision necessary in the execution of portraits; as there every thing the most minute must be made out and expressed, according to the original subject, without any license to the fancy of the designer in deviating from it, or varying the effect either by that masterly negligence and simplicity in some parts, or those bold sallies of the imagination and hand in others, which give spirit and force to history-painting.

The principal instruments used in engraving with the tool are, gravers, scrapers, a burnisher, an oil-stone, and a cushion for bearing the plates.

Gravers are made in several forms with respect to the points, some being square, others lozenge; the square graver for cutting broad and deep, and the lozenge for more delicate and fine strokes and hatches. La Boffe recommends, as the most generally useful, such as are of a form betwixt the square and lozenge: and he advises, that they should be of a good length; small towards the point, but stronger upwards, that they may have strength enough to bear any stress there may be occasion to lay upon them: for if they be too small and mounted high, they will bend; which frequently causes their breaking, especially if they be not employed for very small subjects.

The burnisher is used to assist in the engraving on some occasions, as well as to polish the plates. It is seven inches in length, and made of fine steel well polished. The burnisher is formed at one end, and a scraper on the other, each about an inch and a half long from the point: betwixt them, about four inches of the instrument is made round, and serves as a handle; and is thicker in the middle than at the necks, where the burnisher and scraper begin, which necks are only one quarter of an inch in diameter. The principal application of it in engraving, besides its use in polishing the plates, is to take out any scratches or accidental defacings that may happen to the plates during the engraving; or to lessen the effect of any parts that may be too strongly marked in the work, and require to be taken down.

A cushion, as it is called, is likewise generally used for supporting the plate in such a manner, that it may be turned every way with ease. It is a bag of leather filled with sand, which should be of the size that will best suit the plates it is intended to bear. They are round, and about nine inches over, and three inches in thickness.

The cushion, made as above directed, being laid on the table, the plate must be put upon it; and the graver being held in the hand in a proper manner, the point must be applied to the plate, and moved in the proper direction for producing the figures of the lines intended: observing, in forming straight lines, to hold the plate steady on the cushion; and where they are to be finer, to press more lightly, using greater force where they are to be broader and deeper. In making circular or other curve lines, hold your hand and graver steadily; and as you work, turn

your plate upon the cushion against your graver, other-
wise it will be impossible for you to make any circular or curved line with that neatness and command of hand you by this means may. After part of the work is engraved, it is necessary to scrape it with the scraper or graver, passed in the most level direction over the plate to take off the roughness formed by the cutting of the graver; but great care must be taken not to incline the edge of the scraper or tool used, in such a manner that it may take the least hold of the copper, as it would otherwise produce false strokes or scratches in the engraving: and that the engraved work may be rendered more visible, it may afterwards be rubbed over with a roll of felt dipped in oil. In using the graver, it is necessary to carry it as level as possible with the surface of the plate; for otherwise, if the fingers slip betwixt them, the line that will be produced, whether curve or straight, will become deeper and deeper in the progress of its formation; which entirely prevents strokes being made at one cut, that will be fine at their extremities, and larger in the middle; and occasions the necessity of retouching to bring them to that state. For this reason, it is very necessary for those who would learn to engrave in perfection, to endeavour, by frequent trials, to acquire the habit of making such strokes both straight and curving, by lightening or sinking the graver with the hand, according to the occasion. If, after finishing the design, any scratches appear, or any part of the engraving be falsely executed, such scratches, or faulty parts, must be taken out by the burnisher, and further polished, if necessary, by the above mentioned roll.

The plate being thus engraved, it is proper to round off the edges, by using first a rough file, and afterwards a smoother; and to blunt the corners a little by the same means: after which, the burnisher should be passed over the edges to give it a farther polish.

The dry point, or needle, which has been of late much used in engraving, is a tool like an etching point, which being drawn hard on the copper, cuts a stroke, and raises a burr; the burr is scraped off, and there remains a stroke more soft and delicate than can be produced in any other way.

In the conduct of the graver and dry point consists all the art; for which there are no rules to be given; all depending on the habitude, disposition, and genius, of the artist. However, besides the explanations already given, some general observations and directions may not be improper. As the principles of engraving are the same with those of painting, a person cannot expect to attain any considerable degree of perfection in this art who is not a good master of design; and therefore he ought to be well acquainted both with perspective and architecture: for the former, by the proper gradations of strong and faint colours, will enable him to throw backwards the figures and other objects of the picture or design which he proposes to imitate; and the latter will teach him to preserve the due proportion of its several orders, which the painter often entrusts to the discretion of the engraver. In order to preserve equality and union in his works, the engraver should always sketch out the principal objects of his piece before he undertakes to finish them. In working, the strokes of the graver should never be crossed too much in a lozenge manner, particularly in the

Engraving. the representation of flesh, because sharp angles produce the unpleasing effect of lattice-work, and take from the eye the repose which is agreeable to it in all kinds of picturesque designs: we should except the case of clouds, tempests, waves of the sea, the skins of hairy animals, or the leaves of trees, where this method of crossing may be admitted. But in avoiding the lozenge, it is not proper to get entirely into the square, which would give too much of the hardness of stone. In conducting the strokes, the action of the figures, and of all their parts, should be considered; and it should be observed how they advance towards, or recede from the eye; and the graver should be guided according to the risings or cavities of the muscles or folds, making the strokes wider and fainter in the light, and closer and firmer in the shades. Thus the figures will not appear jagged; and the hand should be lightened in such a manner, that the outlines may be formed and terminated without being cut too hard; however, though the strokes break off where the muscle begins, yet they ought always to have a certain connection with each other, so that the first stroke may often serve by its return to make the second, which will show the freedom of the engraver.

In engraving the flesh, the effect may be produced in the lighter parts and middle tints by long pecks of the graver, rather than by light lines; or by round dots; or by dots a little lengthened by the graver; or, best of all, by a judicious mixture of these together.

In engraving the hair and the beard, the engraver should begin his work by laying the principal grounds, and sketching the chief shades in a careless manner, or with a few strokes; and he may finish it at leisure with finer and thinner strokes to the extremities. When architecture or sculpture is to be represented, except it be old and ruinous buildings, the work ought not to be made very black; because, as edifices are commonly constructed either of stone or white marble, the colour, being reflected on all sides, does not produce dark or brown shades as in other substances. White points must not be put in the pupils of the eyes of figures, as in engravings after paintings; nor must the hair or beard be represented as in nature, which makes the locks appear flowing in the air; because in sculpture there can be no such appearances.

In engraving cloths of different kinds, linen should be done with finer and closer lines than other sorts, and be executed with single strokes. Woollen cloth should be engraved wide, in proportion to the coarseness or fineness of the stuff, and with only two strokes; and when the strokes are crossed, the second should be smaller than the first, and the third than the second. Shining stuffs, which are generally of silk or satin, and which produce flat and broken folds, should be engraved more hard and more straight than others, with one or two strokes, as their colours are bright or brown; and between the first strokes other smaller must be joined, which is called interlining. Velvet and plush are expressed in the same manner, and should always be interlined. Metals, as armour, &c. are also represented by interlining, or by clear single strokes. In architecture, the strokes which form the rounding object should tend to the point of sight; and when

whole columns occur, it is proper to produce the effect as much as possible by perpendicular strokes. If a gross stroke is put, it should be at right angles, and wider and thinner than the first stroke. In engraving mountains, the strokes ought to be frequently discontinued and broken, for sharp and craggy objects; and they should be straight, in the lozenge manner, and accompanied with long points or dots; and rocks should be represented by cross strokes more square and even. Objects that are distant towards the horizon should be kept very tender, and slightly charged with black. Waters that are calm and still are best represented by strokes that are straight, and parallel to the horizon, interlined with those that are finer; omitting such places as, in consequence of gleams of light, exhibit the shining appearance of water; and the form of objects reflected from the water, at a small distance upon it, or on the banks of the water, are expressed by the same strokes, retouched more strongly or faintly as occasion may require, and even by some that are perpendicular. For agitated waters, as the waves of the sea, the first strokes should follow the figure of the waves, and may be interlined, and the cross strokes ought to be very lozenge. In cascades, the strokes should follow the fall, and be interlined. In engraving clouds, the graver should sport when they appear thick and agitated, in turning every way according to their form and their agitation. If the clouds are dark, so that two strokes are necessary, they should be crossed more lozenge than the figures, and the second strokes should be rather wider than the first. The flat clouds, that are lost insensibly in the clear sky, should be made by strokes parallel to the horizon, and a little waving; if second strokes are required, they should be more or less lozenge; and when they are brought to the extremity, the hand should be so lightened, that they may form no outline. The flat and clear sky is represented by parallel and straight strokes, without the least turning. In landscapes, the trees, rocks, earth, and herbage, should be etched as much as possible; nothing should be left for the graver but perfecting, softening, and strengthening. The dry point produces an effect more delicate than the graver can, and may be used to great advantage in linen, skies, distances, ice, and often in water, especially in small engravings. In most things it is proper to etch the shadows, only leaving the lighter tints for the dry point, graver, &c.

To imitate *chalk-drawings*, a mixture of varied and irregular dots are used, made more or less soft, so as to resemble the grain produced by the chalks on paper. Every stroke of the chalks on paper may be considered as an infinite number of adjoining points, which are the small eminences of the grain of the paper touched by the chalk in passing over it. When the copper-plate has been polished and varnished, or properly prepared, as in the common method of engraving, the drawing to be imitated may be counterproved on the varnish of the plate. If this cannot be conveniently done, black lead pencil, or red chalk, must be applied to varnished or oiled paper; and by means of this chalk or pencil, all the traces of the original will be transmitted to the varnish. The outlines of the object must be formed in the etching by points, whose magnitude and distance must be determined by the quality of the strokes in the original.

Engraving. ginal drawing. The artist may be provided with pointed instruments or needles of various sizes with single or double points. In forming the light and shade, he should distinguish between those hatches which serve to express the perspective of the object and those which form the ground of it. The principal hatches should be more strongly marked; the middle tints, if etched, should be marked lightly, or they may be left till the varnish is taken off, and be perfected with a greater degree of softness, by needles or the point of the graver, as the original may require. There is nothing peculiar in the method of applying the aquafortis in this kind of engraving; but it may be observed, that it should not be left so long as to corrode the lighter parts too much: if the light parts are sufficiently corroded, they may be stopped out with turpentine varnish and lamp-black mixed together, and the aquafortis may be applied again to the stronger parts; for it will be no detriment to them, if the points which compose the shade burst into one another, provided the extreme be avoided. When the work of the aquafortis is finished, and the varnish taken off the copper, it will be necessary in the softest parts, such as the flesh, &c. to interstipple with proper points; as an effect will be thus produced more delicate than it is possible to attain with the aquafortis only; and the strongest shades will require additional strength to be given them with small strokes of the graver. Drawings made with chalks of different colours may be imitated in this manner, if a plate be provided for every colour.—This method of engraving is intended to form a kind of deception, so that the connoisseur may not be able, on the first inspection, to distinguish between the original drawing and the engraving made in imitation of it; and it is extremely useful, as it serves to multiply copies of drawings left by those masters who excelled in the use of chalks, and thus to form and improve young artists, who could not have access to the originals in the practice of drawing.

ENGRAVING upon Glass. See CHEMISTRY, 2d N° 857.

ENGRAVING on Precious Stones, is the representing of figures, or devices, in relief or indented, on divers kinds of hard polished stones.

The art of engraving on precious stones is one of those wherein the ancients excelled; there being divers antique agates, cornelians, and onyxes, which surpass any thing of that kind the moderns have produced. Pyrgoteles among the Greeks, and Dioscorides under the first emperors of Rome, are the most eminent engravers we read of: the former was so esteemed by Alexander, that he forbade any body else to engrave his head; and Augustus's head, engraven by the latter, was deemed so beautiful, that the succeeding emperors chose it for their seal.

All the polite arts having been buried under the ruins of the Roman empire, the art of engraving on stones met with the same fate. It was retrieved in Italy at the beginning of the 15th century, when one John of Florence, and after him Dominic of Milan, performed works of this kind no way to be despised. From that time, such sculptures became common enough in Europe, and particularly in Germany, whence great numbers were sent into other countries: but they came short of the beauty of those of the ancients, espe-

N° 117.

cially those on precious stones; for, as to those on *Engraving.* crystal, the Germans, and, after their example, the French, &c. have succeeded well enough.

In this branch of engraving, they make use either of the diamond or of emery.

The diamond, which is the hardest of all stones, is only cut by itself, or with its own matter. The first thing to be done in this branch of engraving is, to cement two rough diamonds to the ends of two sticks big enough to hold them steady in the hand, and to rub or grind them against each other till they be brought to the form desired. The dust or powder that is rubbed off serves afterwards to polish them, which is performed with a kind of mill that turns a wheel of soft iron. The diamond is fixed in a brass dish; and, thus applied to the wheel, is covered with diamond dust, mixed up with oil of olives; and when the diamond is to be cut facet-wise, they apply first one face, then another, to the wheel. Rubies, sapphires, and topazes, are cut and formed the same way on a copper wheel, and polished with tripoli diluted in water. As to agates, amethysts, emeralds, hyacinths, granites, rubies, and others of the softer stones, they are cut on a leaden wheel, moistened with emery and water, and polished with tripoli on a pewter wheel. Lapis-lazuli, opal, &c. are polished on a wooden wheel. To fashion and engrave vases of agate, crystal, lapis-lazuli, or the like, they make use of a kind of lathe, like that used by pewterers, to hold the vessels, which are to be wrought with proper tools: that of the engraver generally holds the tools, which are turned by a wheel; and the vessel is held to them to be cut and engraved, either in relief or otherwise; the tools being moistened from time to time with diamond dust and oil, or at least emery and water. To engrave figures or devices on any of these stones, when polished, such as medals, seals, &c. they use a little iron wheel, the ends of whose axis are received within two pieces of iron, placed upright, as in the turner's lathe; and to be brought closer, or set further apart, at pleasure; at one end of the axis are fitted the proper tools, being kept tight by a screw. Lastly, The wheel is turned by the foot, and the stone applied by the hand to the tool, and is shifted and conducted as occasion requires.

The tools are generally of iron, and sometimes of brass; their form is various, but it generally bears some resemblance to chisels, gouges, &c. Some have small round heads, like buttons, others like ferrels, to take the pieces out, and others flat, &c. When the stone has been engraven, it is polished on wheels of hair-brushes and tripoli.

ENGRAVING on Steel is chiefly employed in cutting seals, punches, matrices, and dyes, proper for striking coins, medals, and counters. The method of engraving with the instruments, &c. is the same for coins as for medals and counters: All the difference consists in their greater or less relief; the relief of coins being much less considerable than that of medals, and that of counters still less than that of coins.

Engravers in steel commonly begin with punches, which are in relief, and serve for making the creux or cavities of the matrices and dyes: though sometimes they begin with the creux or hollowness; but then it is only when the intended work is to be cut very

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very shallow. The first thing done, is that of designing the figures; the next is the moulding them in wax, of the size and depth they are to lie, and from this wax the punch is engraven. When the punch is finished, they give it a very high temper, that it may the better bear the blows of the hammer with which it is struck to give the impression to the matrice.

The steel is made hot to soften it, that it may the more readily take the impression of the punch; and after striking the punch on it in this state, they proceed to touch up or finish the strokes and lines, where by reason of their fineness or the too great relieve they are any thing defective, with steel gravers of different kinds, chisels, flatters, &c. being the principal instruments used in graving on steel.

The figure being thus finished, they proceed to engrave the rest of the medal, as the mouldings of the border, the engrailed ring, letters, &c. with little steel punches, well tempered, and very sharp.

ENGUICHE', in heraldry, is said of the great mouth of a hunting horn, when its rim is of a different colour from that of the horn itself.

ENHARMONIC, in music. The Greeks had three different species of music; the *diatonic*, the *chromatic*, and the *enharmonic*. This last was esteemed by much the most agreeable and powerful of the three; but the difficulty of its execution rendered its duration short, and latter artists were upbraided for having sacrificed it to their indolence. It proceeded upon lesser intervals than either the diatonic or chromatic; and as the chromatic semitone is still less than the diatonic, the *enharmonic* intervals must have consisted of that semitone divided into parts more minute. In Rousseau's Musical Dictionary (at the word *Enharmonique*); the reader may see how that interval was found in the tetrachords of the ancients. It is by no means easy for modern ears, inured to intervals so widely different, to imagine how a piece of music, whose transitions were formed either chiefly or solely upon such minute divisions, could have such wonderful effects; yet the melody of speech, which rises or falls by intervals still more minute than the enharmonic, when properly modulated and applied with taste, has an astonishing power over the soul. As to the modern *enharmonic* system, we may likewise refer the reader to the same work for an account of its nature and use; though he will find it accurately and clearly explained by D'Alembert, in the Treatise of Music given in the present work, (art. 144. 145. 146.)

ENHYDRUS, in natural history, a genus of siderochita or crustated ferruginous bodies, formed in large and in great part empty cases, inclosing a small quantity of an aqueous fluid.

Of this genus there are only two species: 1. The thick-shelled enhydrus, with black, reddish-brown, and yellow crusts. 2. The thinner-shelled kind, with yellowish-brown and purple crusts; neither of which ferments with aquafortis or gives fire with steel.

ENIGMA. See *ÆNIGMA*.

ENIXUM, among chemists, a kind of natural salt, generated of an acid and an alkali.

The sal enixum of Paracelsus, is the caput mortuum of spirits of nitre with oil of vitriol, or what remains in the retort after the distillation of this spirit; being of a white colour, and pleasing acid taste.

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ENMANCHE', in heraldry, is when lines are drawn from the centre of the upper edge of the chief to the sides, to about half the breadth of the chief; signifying sleeved, or resembling a sleeve, from the French *manche*.

ENNA, (anc. geog.), a town of Sicily, situated on an eminence to the south of the Chrysas; called the *centre of Sicily*. It was famous for a sacred grove, in which the rape of Proserpina happened; for a temple of Ceres, thence surnamed *Ennea*, and *Ennensis*; and for fine springs, whence the name (Bochart.)

ENNEAGON, in geometry, a polygon with nine sides. See *POLYGON*.

ENNEAHEDRIA, in natural history, a genus of columnar, crystalliform, and double-pointed spars, composed of a trigonal column, terminated at each end by a trigonal pyramid.

Of this genus there are several species, distinguished by the length or shortness of the column and pyramids, none of which give fire with steel, but all of them ferment with aquafortis. See *SPAR*.

ENNEANDRIA, in botany (from *ennea* nine, and *andria* a man or husband), the name of the ninth class in Linnæus's sexual system, consisting of plants which have hermaphrodite flowers with nine stamina or male organs. See *BOTANY*, p. 430. the *Scheme*.

ENNIUS (Quintus), an ancient Latin poet, born at Rudii, a town in Calabria. He came first to Rome when M. Porcius Cato was questor, whom he had instructed in the Greek language in Sardinia; and by his genius and behaviour he gained the esteem of the most eminent persons in the city. According to Horace, Ennius never applied himself to writing till he had drank freely of wine. Hence he contracted the gout, of which he died nine years B. C. He was interred in Scipio's sepulchre; who had a great esteem and friendship for him, and caused a statue to be erected to him upon his monument. He endeavoured to introduce the treasures of the Greek tongue among the Latins, and was the first among the Romans who made use of heroic verses. He wrote the *Annals of Rome*; he translated several tragedies from the Greek, and wrote others, beside several comedies. We have only some fragments of his works, which were first collected by the two Stephens, and afterwards published at Naples, with a learned commentary, by Jerom Columna, in quarto, 1590; and reprinted at Amsterdam in 1707, in quarto, with additions by Hesselius.

ENOCH, the son of Cain (Gen. iv. 17.), in honour of whom the first city taken notice of in scripture was called *Enoch* by his father Cain, who built it. It was situated to the east of the province of Eden.

ENOCH, the son of Jared and father of Methuselah, was born in the year of the world 622. At the age of 65 he begat Methuselah, and lived 300 years after, and had several sons and daughters. Enoch walked with God; and after that he had lived in all 365 years, "he was not, for God took him." Some construe these last words, as if they intimated that Enoch died a natural death, because in reality he lived not near so long as the other patriarchs of those times; as if God, to secure him from corruption, had been

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Enoch.

Enoch
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been pleased to take him early out of this world. But the generality of the fathers and commentators assert that he died not, but was translated out of the sight of men, in like manner as Elijah was. The apostle Paul (Heb. xi. 5.) shows very clearly that Enoch was translated, and did not see death.

The apostle Jude (ver. 14, 15.) cites a passage from the book of Enoch, which has very much exercised interpreters. The question is, whether the apostle took this passage out of any particular book written by Enoch, which might be extant in the first ages of the church? whether he received it by tradition? or lastly, by some particular revelation? It is thought probable, that he read it in the book we have been speaking of, which, tho' apocryphal, might contain several truths that St Jude, who was favoured with a supernatural degree of understanding, might make use of to the edification of the faithful.

The ancients greatly esteemed the prophecy of Enoch. Tertullian expresses his concern, that it was not generally received in the world. That father, on the authority of this book, deduces the original of idolatry, astrology, and unlawful arts, from the revolted angels, who married with the daughters of men. St Augustin allows indeed that Enoch wrote something divine, because he is cited by St Jude; but he says it was not without reason that this book was not inserted in the canon which was preserved in the temple at Jerusalem. This father sufficiently insinuates, that the authority of this book is doubtful, and that it cannot be proved that it was really written by Enoch. Indeed the account it gives of giants engendered by angels, and not by men, has manifestly the air of a fable, and the most judicious critics believe it ought not to be ascribed to Enoch.

This apocryphal book lay a long time buried in darkness, till the learned Joseph Scaliger recovered a part of it. Scaliger, Vossius, and other learned men, attribute this work to one of those Jews who lived between the time of the Babylonish captivity and that of Jesus Christ. Others are of opinion, that it was written after the rise and establishment of Christianity, by one of those fanatics with whom the primitive church was filled, who made a ridiculous mixture of the Platonic philosophy and the Christian divinity.

The eastern people, who call Enoch by the name of *Edris*, believe that he received from God the gift of wisdom and knowledge; and that God sent him 30 volumes from heaven, filled with all the secrets of the most mysterious sciences. The Rabbins maintain, that when Enoch was translated to heaven, he was admitted into the number of the angels, and is the person generally known by the name of *Michael*.

ENORMOUS, something excessive or monstrous, especially in bulk.—The word is formed of the privative *e*, and *norma*, "rule;" q. d. "void of, or contrary to, rule or measure;" *contra normam*. In the corrupt ages of Latinity, they used *innormis*, and *inormis*.

In the French jurisprudence, *lesio enormis*, "enormous damage," is that which exceeds half the value of the thing sold.

ENOS, the son of Seth and father of Cainan, was born in the year of the world 235. Moses tells us (Gen. iv. 26.), that then "men began to call upon the name of the Lord;" or, as others translate it, that "Enos began to call upon the name of the

Lord;" that is to say, that he was the inventor of religious rites and ceremonies in the external worship which was paid to God. This worship was kept up and preserved in Enos's family, while Cain's family was plunged in all manner of irregularities and impieties. Several Jews are of opinion, that idolatry was at first introduced into the world in the time of Enos. They translate the Hebrew thus, "Then men began to profane the name of the Lord." Good men, to distinguish themselves from the wicked, began to take upon them the quality of sons or servants of God; for which reason, Moses (Gen. vi. 1, 2.) says, that *the sons of God* (that is to say, the descendants of Enos, who had hitherto preserved the true religion), seeing the daughters of men, that they were fair, took them wives of all which they chose. Enos died at the age of 905 years, in the year of the world 1140.

ENS, among metaphysicians, denotes entity, being, or existence: this the schools call *ens reale*, and *ens positivum*; to distinguish it from their *ens rationis*, which is only an imaginary thing, or exists but in the imagination.

ENSs, among chemists, imports the power, virtue, and efficacy, which certain substances exert upon our bodies.

ENSs, in geography, a city of Germany, situated at the confluence of the Danube and the river Ens, about 80 miles south of Vienna. E. Long. 14. 20. N. Lat. 48. 16.

ENSATÆ, in botany (from *ensis*, "a sword"); the name of the sixth order in Linnæus's natural method, consisting of plants with sword-shaped leaves *. It contains the following genera, viz. Antholyza, Cal-
* See Botany, p. 458, col. 2.
lisia, Commelina, Crocus, Eriocaulon, Ferraria, Gladiolus, Iris, Ixia, Moræa, Pontæderia, Sifyrinchium, Tradescantia, Wachendorffia, Xyris.

ENSEELED, in falconry, is said of a hawk that has a thread drawn through her upper eye-lid, and made fast under her beak, to take away the sight.

ENSEMBLE, a French term, sometimes used in our language; literally signifying *together*, or *one with another*:—being formed from the Latin *in* and *simul*.

In architecture, we say *the ensemble*, or *tout ensemble*, of a building; meaning the whole work, or composition, considered together, and not in parts; and sometimes also, the relative proportion of the parts to the whole.—"All those pieces of building make a fine *ensemble*."

To judge well of a work, a statue, or other piece of sculpture, one must first examine whether the *ensemble* be good. The *tout ensemble* of a painting, is that harmony which results from the distribution of the several objects or figures whereof it is composed.—"This picture is good, taking the parts separately; but the *tout ensemble* is bad."

ENSIFORMIS CARTILAGO. See XIPHOIDES.

ENSIGN, in the military art, a banner or colours under which soldiers are ranged, according to the different companies or parties they belong to. See FLAG, COLOURS, STANDARD, &c.

The Turkish ensigns are horses tails; those of the Europeans are pieces of taffety, with divers figures, colours, arms, and devices thereon. Xenophon tells us, that the ensign bore by the Persians was a golden eagle on a white flag; the Corinthians bore the winged horse, or Pegasus, in theirs; the Athenians, an owl; the

Ens
||
Ensign.

Ensign || the Messenians, the Greek letter M; the Lacedæmo-
 || nians, the Λ. The Romans had a great diversity of
 Entc. ensigns; the wolf, minotaur, horse, boar, and at length
 the eagle, where they stopped: this was first assumed
 in the second year of the consulate of Marius †. A
 † See Eagle military ensign on a medal of a Roman colony, denotes
 it a colony peopled with old soldiers.

ENSIGN is also the officer that carries the colours, being the lowest commissioned officer in a company of foot, subordinate to the captain and lieutenant. It is a very honourable and proper post for a young gentleman at his first coming into the army: he is to carry the colours both in assault, day of battle, &c. and should not quit them but with his life: he is always to carry them himself on his left shoulder: only on a march he may have them carried by a soldier. If the ensign is killed, the captain is to carry the colours in his stead.

Naval ENSIGN, a large standard or banner hoisted on a long pole erected over the poop, and called the *ensign staff*.—The ensign is used to distinguish the ships of different nations from each other, as also to characterise the different squadrons of the navy. The British ensign in ships of war is known by a double cross, viz. that of St George and St Andrew, formed upon a field which is either red, white, or blue.

ENSISHEIM, a town of France, in Upper Alsace. It is a pretty little place, well built, and consists of about 200 houses. E. Long. 7. 41. N. Lat. 47. 49.

ENT (Sir George), an eminent English physician, born at Sandwich in Kent in 1604. He was educated at Sidney college, Cambridge; and, afterwards travelling into foreign countries, received the degree of doctor of physic at Padua. After his return he obtained great practice, was made president of the college of physicians in London, and at length received the honour of knighthood from King Charles II. He was extremely intimate with Doctor Harvey; whom he learnedly defended in a piece intitled, *Apologia pro Circulatione Sanguinis, contra Æmilium Parisanum*. He also published, *Animadversiones in Malachie Thruston*; and some observations in the Philosophical Transactions. Glanville, speaking of his Plus Ultra of the modern improvements in anatomy, numbers Sir George Ent, Doctor Glisson, and Doctor Wallis, with the most celebrated discoverers in that science. The two former were among the first members of the Royal Society. Sir George Ent died in October 1689.

ENTABLATURE, or **ENTABLEMENT**, in architecture, is that part of an order of a column which is over the capital, and comprehends the architrave, frieze, and cornice. See **ARCHITECTURE**, chap. i.

ENTABLER, in the manege, the fault of a horse whose croupe goes before his shoulders in working upon volts; which may be prevented by taking hold of the right rein, keeping your right leg near, and removing your left leg as far from the horse's shoulder as possible.

This is always accompanied with another fault called *aculer*. See **ACULER**.

ENTAIL, in law, signifies *feetail*, or *fee entailed*; that is, abridged, curtailed, or limited, to certain conditions. See **FEE**, and **TAIL**.

ENTE, in heraldry, a method of marshalling, more

frequent abroad than with us, and signifying grafted or ingrafted.

We have, indeed, one instance of enté in the fourth grand quarter of his majesty's royal ensign, whose blazon is Brunswick and Lunenburg impaled with ancient Saxony, *enté en pointé*, "grafted in point."

ENTEROCELE, in surgery, a tumor formed by a prolapsion of the intestines through the rings of the abdomen and processes of the peritonæum, into the scrotum. See **SURGERY**.

ENTHUSIASM, an ecstasy of the mind, whereby it is led to think and imagine things in a sublime, surprising, yet probable manner. This is the enthusiasm felt in poetry, oratory, music, painting, sculpture, &c.

ENTHUSIASM, in a religious sense, implies a transport of the mind, whereby it fancies itself inspired with some revelation, impulse, &c. from heaven. Mr Locke gives the following description of enthusiasm. "In all ages, men in whom melancholy has mixed with devotion, or whose conceit of themselves has raised them into an opinion of a great familiarity with God, and a nearer admittance to his favour than is afforded to others, have often flattered themselves with a persuasion of an immediate intercourse with the Deity, and frequent communications from the Divine Spirit. Their minds being thus prepared, whatever groundless opinion comes to settle itself strongly upon their fancies, is an illumination from the Spirit of God. And whatsoever odd action they find in themselves a strong inclination to do, that impulse is concluded to be a call or direction from heaven, and must be obeyed. It is a commission from above, and they cannot err in executing it. This I take to be properly enthusiasm, which, though arising from the conceit of a warm and overweening brain, works, when it once gets footing, more powerfully on the persuasions and actions of men, than either reason or revelation, or both together; men being most forwardly obedient to the impulses they receive from themselves." Devotion, when it does not lie under the check of reason, is apt to degenerate into enthusiasm. When the mind finds itself inflamed with devotion, it is apt to think that it is not of its own kindling, but blown up with something divine within it. If the mind indulges this thought too far, and humours the growing passion, it at last flings itself into imaginary raptures and ecstasies; and when once it fancies itself under the influence of a divine impulse, no wonder if it flights human ordinances, and refuses to comply with the established form of religion, as thinking itself directed by a much superior guide.

ENTHUSIAST, a person possessed with enthusiasm. See the preceding article.

ENTHYMEME, in logic and rhetoric, an argument consisting only of two propositions, an antecedent, and a consequent deduced from it. The word is Greek, *ενθυμημα*, formed of the verb *ενθυμισθαι*, "to think, conceive," a compound of *εν* and *θυμος*, "mind."

The enthymeme is the most simple and elegant of all argumentations; being what a man, in arguing closely, commonly makes, without attending at all to the form. Thus, that verse remaining of Ovid's tragedy, intitled *Medea*, contains an enthymeme; *Servare potui, perdere an possum rogas*: "I was able to save you; consequently to have destroyed you." All the beauty

Enterocèle
 ||
 Enthymeme.

Enthymeme.

would have been lost, had all the propositions been expressed; the mind is displeased with a rehearsal of what is no ways necessary.

Sometimes, also, the two propositions of an enthymeme are both included in a single proposition, which

Aristotle calls an *enthymematical sentence*, and gives this instance thereof: *Mortal, do not bear an immortal hatred. The whole enthymeme would be, Thou art mortal; let not, therefore, thy hatred be immortal.*

ENTITY, the same with ENS.

E N T O M O L O G Y;

THE science of insects, or that part of zoology which treats of insects.

By some natural historians, this class of animals is considered as the most imperfect of any, while others prefer them to the larger animals. One mark of their imperfection is said to be, that many of them can live a long time, though deprived of those organs which are necessary to life in the higher ranks of nature. Many of them are furnished with lungs and an heart, like the nobler animals; yet the caterpillar continues to live, though its heart and lungs, which is often the case, are entirely eaten away.—It is not, however, from their conformation alone that insects are inferior to other animals, but from their instincts also. It is true, that the ant and the bee present us with striking instances of assiduity; yet even these are inferior to the marks of sagacity displayed by the larger animals. A bee taken from the swarm is totally helpless and inactive, incapable of giving the smallest variations to its instincts. It has but one single method of operating; and if put from that, it can turn to no other. In the pursuits of the hound, there is something like choice; but in the labours of the bee, the whole appears like necessity and compulsion.—All other animals are capable of some degree of education; their instincts may be suppressed or altered; the dog may be taught to fetch and carry, the bird to whistle a tune, and the serpent to dance: but the insect has only one invariable method of operating; no arts can turn it from its instincts; and indeed its life is too short for instruction, as a single season often terminates its existence.—Their amazing number is also an imperfection. It is a rule that obtains through all nature, that the nobler animals are slowly produced, and that nature acts with a kind of dignified economy; but the meaner births are lavished in profusion, and thousands are brought forth merely to supply the necessities of the more favourite part of the creation. Of all productions in nature, insects are by far the most numerous. The vegetables which cover the surface of the earth bear no proportion to the multitudes of insects; and though, at first sight, herbs of the field seem to be the parts of organized nature produced in the greatest abundance, yet, upon more minute inspection, we find every plant supporting a mixture of scarce perceptible creatures, that fill up the compass of youth, vigour, and age, in the space of a few days existence.—In Lapland, and some parts of America, the insects are so numerous, that if a candle is lighted they swarm about it in such multitudes, that it is instantly extinguished by them; and in these parts of the world, the miserable inhabitants are forced to smear their bodies and faces with tar, or some other unctuous composition, to protect them from the stings of their minute enemies.

On the other hand, Swammerdam argues for the

perfection of insects in the following manner. “After an attentive examination (says he) of the nature and anatomy of the smallest as well as the largest animals, I cannot help allowing the least an equal, or perhaps a superior, degree of dignity. If, while we dissect with care the larger animals, we are filled with wonder at the elegant disposition of their parts, to what an height is our astonishment raised, when we discover all these parts arranged, in the least, in the same regular manner! Notwithstanding the smallness of ants, nothing hinders our preferring them to the largest animals, if we consider either their unwearied diligence, their wonderful strength, or their inimitable propensity to labour. Their amazing love to their young is still more unparalleled among the larger classes. They not only daily carry them to such places as may afford them food; but if by accident they are killed, and even cut into pieces, they will with the utmost tenderness carry them away piecemeal in their arms. Who can show such an example among the larger animals which are dignified with the title of *perfect*? Who can find an instance in any other creature that can come in competition with this?”

On this dispute it is only necessary to observe, that the wisdom of the Creator is so conspicuous in all his works, and such surprising art is discovered in the mechanism of the body of every creature, that it is very difficult, if not impossible, to say where it is most, and where it is least, to be observed.

Whoever is desirous of attaining a systematic knowledge of insects, ought primarily to be solicitous about acquiring the terms made use of in the science, that so he may be able rightly to denominate every part of an insect. The student is first to know what an insect is, lest he mistake hippocampi, and other amphibious animals, for them, as was formerly done; or confound them with the *vermes*, which Linnæus first distinguished from insects, and which differ as essentially from them as the class mammalia do from birds. Every insect is furnished with a head, antennæ, and feet, of all which the vermes are destitute. All insects have six or more feet; they respire through pores placed on the sides of their bodies, and which are termed *spiracula*: their skin is extremely hard, and serves them instead of bones, of which they have internally none. From this definition, the *acus marina* is evidently no insect. But the antennæ placed on the fore-part of the head, constitute the principal distinction. These are jointed and moveable in every part, in which they differ from the horns of other animals: they are organs conveying some kind of sense; but we have no more idea of what this kind of sense is, than a man has, who, without eyes, attempts to determine the particular action of the rays of light on the retina of the eye, or to explain the changes which from thence take place in the human mind. That they are the organs of some kind

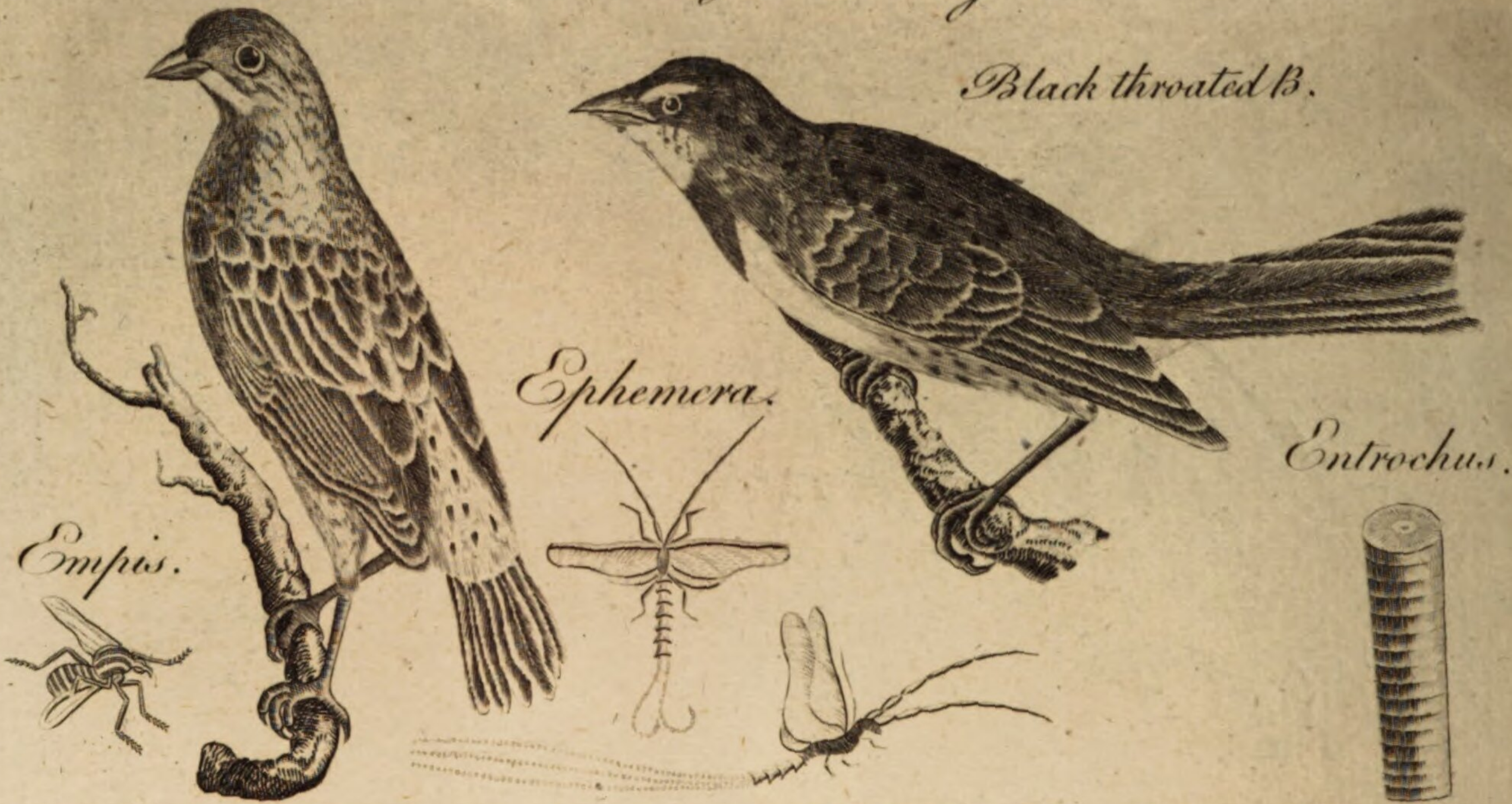
of

Cinereous B.

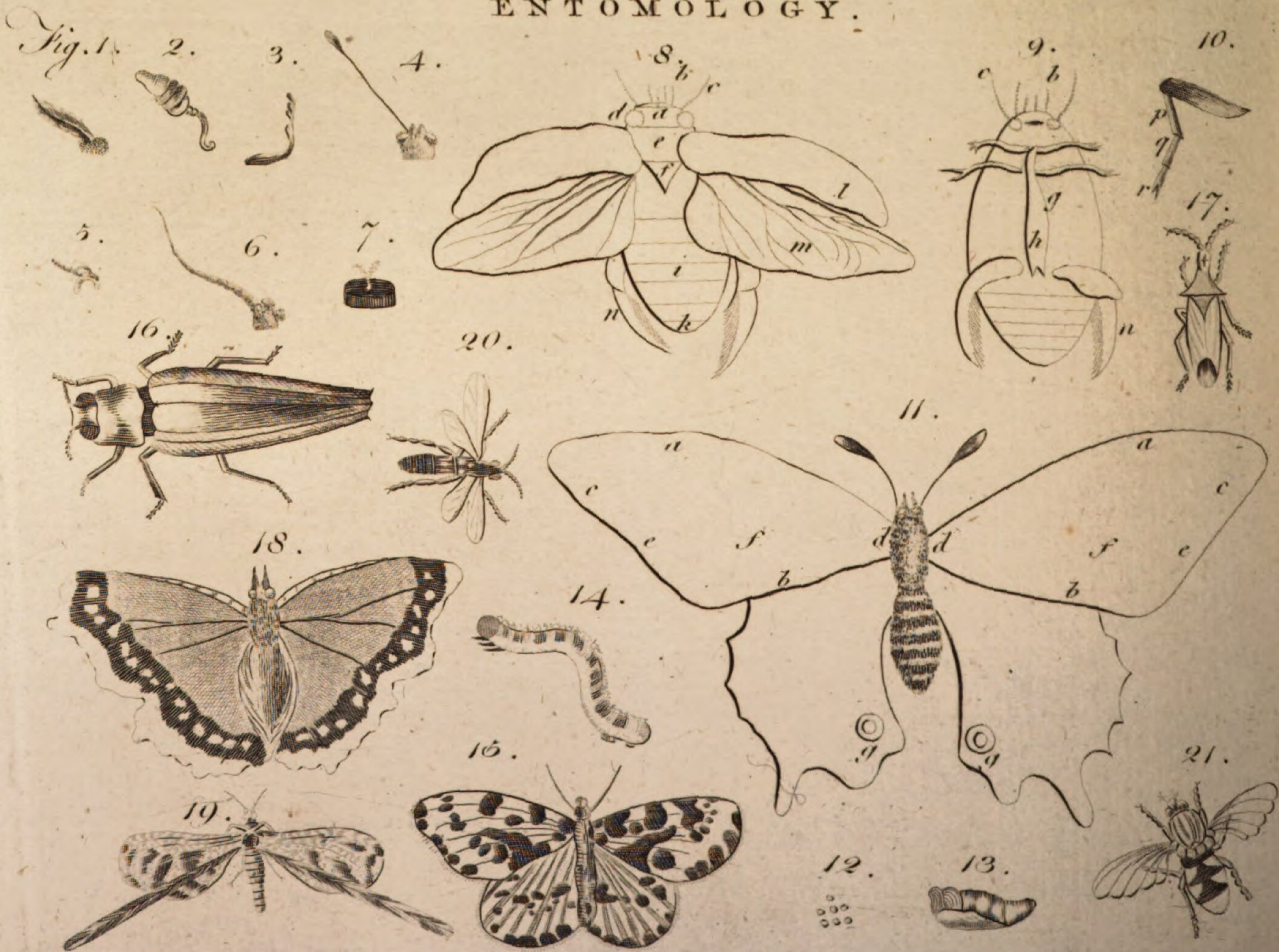
Emberiza, or Bunting.

Plate CLXXXII.

Black throated B.



ENTOMOLOGY.



A. Bellin. Del. Sculptor fecit.

Organs of
hearing, &c.

of sense, is apparent from their perpetually moving them forward; yet the hard crust with which they are invested, and their shortness in flies and other insects, would induce one to believe them not to be the organs of touch: Mr Barbut supposes them to constitute or to contain the organs of hearing. That they are tubular, and filled with air, and some kind of humour, appears from the antennæ of butterflies immersed in water.—To come now to the terms of the art. A knowledge of the external parts of the body is first to be established; which, after the method of anatomists, we divide into head, trunk, abdomen, and extremities.

SECT. I. *External Parts of the Body.*

I. CAPUT, the HEAD. This part in insects without brain. The difference between the brain and spinal marrow consists in the former being a medullary part organized. We do not deny the existence of a medullary thread in the heads of insects, but we never could discover it to be organized: hence the hippobosca equina, or horse fly, will live, run, nay even copulate, after being deprived of its head; to say nothing of many others which are capable of living a long while in the same situation.

As they are not apparently furnished with ears, they have been apprehended incapable of hearing; as we can no more conceive that sense to exist without ears than vision without eyes. That they are nevertheless susceptible of any shrill or loud noise, as well as fishes, is indisputable; but it has been supposed to be in a manner different from that of hearing. Mr Barbut, however, supposes them to possess this sense in a very distinct manner. Many insects, he observes, are well known to be endowed with the power of uttering sounds, such as large beetles, the bee, wasp, common fly, gnat, &c. The sphinx atropos squeaks, when hurt, nearly as loud as a mouse. Now, if insects are endowed with the power of uttering sounds, it certainly must be for some purpose. As they vary their cry occasionally, it must certainly be designed either to give notice of pleasure or pain, or some affection in the creature who possesses it. "The knowledge of their sounds (says our author) is undoubtedly confined to their tribe, and is a language intelligible to them only; saving when violence obliges the animal to exert the voice of nature in distress, craving compassion; then all animals understand the doleful cry. For instance, attack a bee or wasp near the hive or nest, or a few of them: the consequence of that assault will be, the animal or animals, by a different tone of voice, will express his or their disapprobation or pain; that sound is known to the hive to be plaintive, and that their brother or brethren require their assistance; and the offending party seldom escapes with impunity. Now, if they had not the sense of hearing, they could not have known the danger their brother or brethren were in by the alteration of their tone."

Another proof, which he reckons still more decisive, was taken from an observation made by himself on a large spider in St James's Park. This creature had made a very large web on a wooden railing; and was, at the time of observation, on one of the rails at a considerable distance from the place where a large fly entangled itself. Nevertheless, the moment the fly

was entangled, the spider became sensible of it; tho', from the situation of the rail, he could not possibly have seen it. In this, however, Mr Barbut might possibly be deceived; because the spider was perhaps alarmed by the tremulous motion of the threads, occasioned by the fluttering of the fly; which he might well know how to distinguish from their vibration by the wind. The organ of hearing, in our author's opinion, is situated in the antennæ; both from their situation in the part of the head most favourable to such organs, their inward structure being moveable, the ears of most inferior animals being so. He has never considered the antennæ as either offensive or defensive, but has observed them to be endowed with an exquisite sense of feeling; that the animal appeared to be in agony when its antennæ were pinched; and that it takes care to avoid the touching any hard substance with them roughly. "This tenderness in the organ of hearing (says he) is common to all animals; and insects seem to be particularly tender in these parts by quickly withdrawing them from the touch."

Our author further observes, that the antennæ of all insects are composed of joints varying in size, form, and number. Those who are chiefly confined to live under water have their antennæ in general shorter than those who live on land. Some who roam at large in the air, have them long and slender. They are all hollow, and are rendered flexible by the joints, which are very visible in the horns of the crab and lobster. This hollowness, in our author's opinion, is to receive the sound communicated to the extremities of the antennæ by the repercussion of the air affected by any noise, and convey it, by means of the joints, from one to another, till it arrives in that lessened degree of tone best suited to the timid nature of the animal. In this circumstance there may be many variations in point of perfection in those organs; the strength, utility, and degree of power in receiving sound being proportioned to the necessities of the animals, different in their nature and requisites. In most animals, the entrance to the auricular organ is patulous; but in this case the animal would suffer great inconvenience from such an organization, as the organ would often be clogged with dirt, &c.

It has also appeared dubious if they have the sense of smell, no organ being found in them adapted to that purpose: and although it was evident they had a perception of agreeable and fetid effluvia, it was thought to be in a manner altogether unknown to us. Mr Barbut is of opinion that the organs of smell reside in the palpi or feelers. Many insects have four and some six, two of which are in general cheliform, in order to assist the insect in conveying its food to its mouth. It may be likewise observed, that the palpi are in continual motion; the animal thrusting them into every kind of putrid or other matter, as a hog would do his nose, smelling and searching after food. Insects which apparently do not possess palpi or spiral tongues, have undoubtedly some organ concealed within the mouth analogous to them in function and utility; the fleshy proboscis of the fly is thrust into every substance in which the animal expects to find food; and when it is extended, nearly in the middle are situated, in our author's opinion, two upright palpi, which, no doubt

Fundamenta
Entomolo-
gie A. J.
Bladh, A-
mæn. acad.
nº 133.

Eyes, Antennæ, &c.

doubt, perform in their turn some office, perhaps that of smell.

Many insects have no tongue, nor make any sound with their mouth; but for this purpose some use their feet, others their wings, and others some elastic instrument with which they are naturally furnished.

EYES. Most insects have two; but the gyrynus has four, the scorpion six, the spider eight, and the scolopendra three. They have no eye-brows, but the external tunic of their eyes is hard and transparent like a watch-glass; their eyes have no external motion, unless it be in the crab. They consist for the most part of one lens only; but in those of the butterfly, dipteræ, and many of the beetles, they are more numerous. Pugett discovered 17,325 lenses in the cornea of a butterfly, and Lieuwenhoek 800 in a fly.

ANTENNÆ. Of these there are in general two (unless four are allowed to some kind of crabs), and placed on the fore-part of the head: they are peculiar to insects; and are plainly distinguishable from the tentaculæ of the vermes, in being crustaceous; and from the palpi of insects, which are more numerous, placed near the mouth, and are sometimes wanting. As the antennæ are of great moment in distinguishing the various kinds of insects, we shall enumerate and explain the several different forms of them.

Setacea, are those which grow gradually taper towards the extremity.

Filiformes, such as are of the same thickness throughout.

Moniliformes, are filiform, like the preceding, but consist of a series of round knobs, like a necklace of beads.

Clavata, such as gradually increase in size toward the extremity.

Capitata, are *clavata*, but have the extremity somewhat round.

Fissiles, are *capitata*; but have the capitulum, or knob, divided longitudinally into three or four parts, or laminæ, as in the scarabæi.

Perfoliata, are also *capitata*; but have the capitulum horizontally divided, as in the dermestes.

Pectinata, so called from their similitude to a comb, though they more properly resemble a feather, as in the moths and elateres. This is most obvious in the male.

Aristata, such as have a lateral hair, which is either naked or furnished with lesser hairs, as in the fly; *Breviores*, those which are shorter than the body; *longiores*, those which are longer than the body; *mediocres*, those which are of the same length with the body; all three of which varieties are distinguishable in the cerambyces.

PALPI, or *Feelers*, resemble filiform, articulated, moveable antennæ. They are most commonly four in number, sometimes six; they are sufficiently distinguished from antennæ, in being naked, short, and always placed at the mouth.

OS, the *Mouth*, is generally placed in the anterior part of the head, extending somewhat downwards. In some insects, it is placed under the breast, as in the chermes, coccus, cancer (crab), and curculio.

ROSTRUM, or *Proboscis*, is the mouth drawn out to a rigid point: in many of the hemiptera class it is bent downward toward the breast and belly, as in the

cicada, nepa, notonecta, cimex (bug), aphid, and remarkably so in some curculiones.

MAXILLÆ, the *Jaws*, are two in number, sometimes four, and at other times more; they are placed horizontally; the inner edge of them in some insects is serrated or furnished with little teeth.

LINGUA, the *Tongue*, in some insects is taper and spiral, as in the butterfly; in others it is fleshy, resembling a proboscis, and tubular, as in the fly.

LABIUM superius, the *upper Lip*, is situated above the jaws; as in the scarabæus and gryllus.

STEMMATA, or *Crown*, are three smooth hemispheric dots, placed generally on the top of the head; as in most of the hymenoptera, and others.

II. TRUNCUS, the *TRUNK*, is that part which comprehends the breast or thorax: it is situated between the head and abdomen; and has the legs inserted into it, that its parts may be distinctly determined. It is divided into *thorax*, *scutellum*, and *sternum*.

THORAX, the *Thorax*, is the back part of the breast; and is very various in its shape. It is called *dentatus*, when its sides are armed with points; *spinosus*, when its back is furnished with them, as in the cerambyx; and *marginatus*, when its margin is laterally dilated, as in the filpha and cassida.

SCUTELLUM, or *Escutcheon*, is the posterior part of the thorax: it is frequently triangular; and appears to be divided from the thorax by an intervening suture, as in most of the coleoptera.

STERNUM, the *Sternum*, is situated on the inferior part of the thorax; it is pointed behind in the elateres, and bifid in some of the dytisci.

III. ABDOMEN, the *ABDOMEN* is in most insects distinct from the thorax; it is the posterior part of the body of the insect; and is composed of a number of annular segments, which serve occasionally to lengthen or shorten it, and to contain the organs of chyfication, &c.

SPIRACULA, are little holes or pores, placed singly on each side of every segment of the abdomen: thro' these the insect breathes; and if oil be applied so as to stop them up, it proves fatal to most of them.

TERGUM, the *Back*, is the superior part of the abdomen.

VENTER, the *Belly*, is the inferior part.

ANUS, is the posterior part of the abdomen, perforated for the evacuation of the excrement. This part also frequently contains the organs of generation.

IV. ARTUS, the *LIMBS* or *EXTREMITIES*, are the various instruments of motion.

PEDES, the *Legs*, are generally six. There is an exception to this, however, in the class Aptera, many of which have eight; as acari (mites), phalangii, most of the aranei (spiders), scorpiones (scorpions), and cancri (crabs). The oniscus has 14, and the iuli and scolopendri still more.

The first joint of the leg, which is generally thickest, is called *femur*; the second, which is generally of the same size throughout, *tibia*; the third, which is jointed, is distinguished by the name of *tarsus*; and the

Tongue,
Legs, &c.

Claws, &c.
of Insects.

the last, which in most insects is double, by that of *unguis*. The legs of insects, in general, are named from the various motions they produce: *Cursorii*, from that of running, which are the most numerous; *saltatorii*, from that of leaping; *natatorii*, from that of swimming, &c.—In the *saltatorii*, the thighs are remarkably large, by which means they are able to leap to a considerable distance, as in the gryllus, grasshopper, &c. In those of the *Natatorii*, the feet are flat, and edged with hairs, which answer the purpose of oars in assisting them to swim, as in the dytiscus.—*Mutici*, are such feet as have no claws.—*Chelæ*, or claws, are the fore-feet enlarged towards their extremities, each of which is furnished with two lesser claws, which act like a thumb and finger; as in the crab.

Alæ, *Wings*, the instruments which enable the to fly. These are membranous and undivided, except in the instance of the *phalænæ alucitæ*, in which they are in part divided. Most insects have four; the diptera-class, and the coccus, however, have two only.

The wing is divided into its superior and inferior surfaces: its anterior part in a butterfly, is that towards the anterior margin, or next to the head; its posterior part, that towards the anus; its exterior part, that towards the outer edge; and the interior, that next the abdomen.

They are called *plicatiles*, when they are folded at the time the insect is at rest, as in the wasp; opposite to these are the *planæ*, which are incapable of being folded.

Erectæ, such as have their superior surfaces brought in contact when the insect is at rest; as in the ephemeræ, libellula puella and virgo, and papilionæ (butterflies.)

Patentes, which remain horizontally extended when the insect is at rest; as in the *phalænæ geometræ*, and most of the libellulæ.

Incumbentes, such as cover horizontally the superior part of the abdomen when the insect is at rest.

Deflexæ, are incumbentes, but not horizontally, the outer edges declining toward the sides.

Reversæ, are deflexæ, with this addition, that the edge of the inferior wings projects from under the anterior part of the superior ones.

Dentatæ, in which the edge is serrated, or scolloped.

Caudatæ, in which one or more projections in the hinder wings are extended into processes.

Reticulatæ, when the vessels of the wings put on the appearance of network, as in the hemerobius perla; the two anterior wings generally become superior, and the posterior ones inferior, in moths, when their wings are closed; but the anterior wings are called *primary*, and the inferior ones *secondary*, in butterflies, as they cannot with propriety be called *inferior* when the wings are erect.

Colores, the colours, these are self-apparent: but according to their several shapes, they take the different names of *puncta*, dots; *maculæ*, spots; *fasciæ*, bands, which frequently run across and sometimes surround the edge of the wings; *strigæ*, streaks, which are very slender fasciæ; and *lineæ*, lines, which are longitudinally extended.

Ocellus, is a round spot, containing a lesser spot of a different colour in its centre. Wings of Insects.

Stigmata, another term lately introduced by Linnaeus, signifies the spot, or anastomosis, in the middle of the wing near the anterior margin; it is conspicuous in most of the hymenoptera and neuroptera, and even in the coleoptera. The single or double kidney-shaped spot, situated in the same part of the anterior wings, and frequently occurring in the *phalænæ paganae*, is distinguished likewise by the name of *stigma*.

Elytra (in the singular number elytron). The upper wings, which are of a hard substance, in some degree resembling leather, and which in most insects are of a very hard texture, but in others flexible, are called *elytra*; their superior surface is generally convex, their inferior one concave. When the insect flies, they are extended; and shut when it rests, closing together, and forming a longitudinal suture down the middle of the back, as in the coleoptera.

They are of various shapes. *Abbreviata*, when shorter than the abdomen. *Truncata*, when shorter than the abdomen, and terminating in a transverse line. *Fastigiata*, when of equal or greater length than the abdomen, and terminating in a transverse line. *Serrata*, when the exterior margin towards the apex is notched or serrated, as in some of the buprestes. *Spinosa*, when their surface is covered with sharp points or prickles. *Scabra*, when their surface is so uneven as to grate against the fingers. *Striata*, when marked with slender longitudinal furrows. *Porcata*, when with elevated longitudinal fulci or ridges. *Sulcata*, when these ridges are concave. *Hemelytra*, when the superior wings are of a middle substance betwixt leather and membrane; either totally so, as in the grylli; or partially so, as in the cimices, nepæ, and notonectæ: These are commonly distinguished by the name *hemiptera*.

Halteres, poisers, (a term also introduced by Linnaeus), are little heads placed on a stalk or peduncle, most frequently under a little arched scale. They are found only in the class diptera, and appear to be nothing more than the rudiments of the hinder wings.

CAUDA, the *Tail*, in most insects is,

Simplex, simple, capable of being extended, and again drawn back at pleasure. In the crab and scorpion, however, it is

Elongata, elongated, or lengthened out.

Setacea, bristle-shaped, or taper; as in the raphidea.

Trifeta, consisting of three bristles; as in the ephemeræ.

Furcata, being forked, as in the podura.

Forcipata, resembling a pair of forceps; as in the forficula.

Foliosa, resembling a leaf; as in the blatta, grylli, and some species of cancri.

Telifera, such as are armed with a dart or sting; as in the scorpion and panorpa.

Aculeus, an instrument with which they wound, and at the same time instil a poison; with such the bee, wasp, scorpion, &c. are furnished.

EXPLANATION of PLATE CLXXXII.

Fig. 1. ANTENNÆ PECTINATÆ, or feathered; as in the *phalænæ*, moths.

2. AN-

2. ANTENNÆ PERFOLIATÆ, or perfoliated; as in the *dermestes* and *dytiscus*.
3. ——— FISSILES, or fissile, divided into laminæ at the extremity, as in the *scarabei*, beetles.
4. ——— CLAVATÆ, or club-shaped, as in the *papilio*, butterfly.
5. ——— MONILIFORMES, like a necklace of beads; as in the *chrysomela*.
6. ——— SETACEÆ, setaceous, or bristle-shaped; as in many of the *phalænæ*.
7. ——— ARISTATÆ, furnished with a lateral hair, as in the *fly*.
8. 9. *a* Caput, the head.
b Palpi, or feelers.
c Antennæ, or horns.
d Oculi, the eyes.
e Thorax.
f Scutellum, or escutcheon.
g Pectus, or breast.
h Sternum, or breast-bone.
i Abdomen, and its segments.
k Anus.
l Elytra, or shells.
m Membranous wings.
n Pedes, or feet, which are natatorii.
10. *o* Femur, or thigh.
p Tibia, or leg.
q Tarsus, or foot.
r Unguis, or claw.
11. *a* The anterior part of the wing.
b The posterior part.
c The exterior part.
d The interior part.
e The margin.
f The disk, or middle.
g Oculus, or eye.
- 12, 13, 14, 15, Represent the insect in its egg, caterpillar, pupa, and perfect state.

SECT. II. Of the Sexes of Insects.

THE same difference of sex exists in insects as in other animals, and they even appear more disposed to increase their species than other animals; many of them, when become perfect, seeming to be created for no other purpose but to propagate their species. Thus the silk-worm, when it arrives at its perfect or moth-state, is incapable of eating, and can hardly fly: it endeavours only to propagate its species; after which the male immediately dies, and the female as soon as she has deposited her eggs.

In many insects, the male and female are with difficulty distinguished; and in some they differ so widely, that an unskilful person might easily take the male and female of the same insect for different species; as for instance, in the *phalæna humuli*, *pinaria*, *russula*; each sex of which differs in colour. This unlikeness is still more apparent in some insects, in which the male has wings and the female none; as in the *coccus*, *lampyris*, *phalæna antiqua*, *brumata*, *lichenella*. And as most insects remain a long while in copulation, as we may see in the *tipula* and silk-worm, the winged males fly with the wingless females, and carry them about from one place to another; as in the *phalæna an-*

tiqua. It is, however, no certain rule, that when one insect of the same species is found to have wings, and the other to be without, the former must necessarily be the male, and the latter the female. The aphides, for instance, are an exception; and besides these, individuals of both sexes, and of the same species, are found without wings, as the *carabi majores*, *tenebriones*, *meles*, *cimices*. The *gryllus pedestris* is likewise destitute of wings; and might have passed for a *gryllus* in its pupa state, had it not been seen in copulation; for it is well known that no insect can propagate its species till it arrives at its last or perfect state.

“Pleraque insectorum genitalia sua intra anum habent abscondita, et penes solitarios, sed nonnulla penem habent bifidum: Cancris autem et Aranei geminos, quemadmodum nonnulla amphibia, et quod mirandum in loco alieno, ut Cancer, sub basi caudæ. *Araneus mas* palpos habet clavatos, qui penes sunt, juxta os utrinque unicum, quæ clavæ sexum nec speciem distinguunt; et fœmina vulvas suas habet in abdomine juxta pectus. Hic vero si unquam vere dixeris, “*Res plena timoris amor*: si enim proci in auspiciato accesserit, fœmina ipsum devorat; quod etiam fit, si non statim se retraxerit. Libellula fœmina genitale suum sub apice gerit caudæ, et mas sub pectore; adeo ut cum mas collum fœminæ forcipe caudæ arripit, illa caudam sub pectore ejus adplicit, sicque peculiari ratione connexæ volitent.”

Besides those of the male and female, a third sex exists in some insects which we call *neuter*: As these have not the distinguishing parts of either sex, they may be considered as eunuchs or infertile.

We know of no instance of this kind in any other class of animals, nor in vegetables, except in the class *Syngenesiæ*, and in the *Opulus*. This kind of sex is only found among those insects which form themselves into societies, as bees, wasps, and ants: and here these kind of eunuchs are real slaves, as on them lies the whole business of the economy; while those of the other sex are idle, only employing themselves in the increase of the family. Each family of *Bees* has one female only (called the *queen*), many males, and an almost innumerable quantity of neuters. Of those, the neuters (whose antennæ have 11 joints) do the working part; they extract and collect honey and wax, build up the cells, keep watch, and do a variety of other things. The males, whose antennæ consist of 15 joints, do no work; they serve the female once, and that at the expence of their lives; they may be considered in the light of a set of parasites, or *ceciisbei*; but as soon as their business of impregnation is over, they are expelled by their servants the neuters, who now shake off the yoke, but yet pay all due respect to their common mother the queen. The same economy nearly takes place in *Wasps*, where the young females, which are impregnated in the autumn, live through the winter, and in the spring propagate their species; but the queen, together with all the males, perish in the winter. Among *Ants*, the neuters form a hill in the shape of a cone, that the water may run off it, and place those which are in the pupa state on that side of it which is least exposed to the heat of the sun. At a considerable distance from these are found the habitations of the males and females, to whom the most ready obedience is yielded by the neuters, till a new offspring suc-

Changes of insects. succeeds, and then they oblige them to quit their habitations. But those ants which live entirely under ground, provide better for themselves in this respect: for a little before their nuptials, they quit their habitation of their own accord, and after swarming in the manner of bees, they copulate in the air; and each retiring to some new habitation, founds a new family.

No *hermaphrodites* have as yet been discovered among insects. There is something very singular, however, in the propagation of the aphides. A female aphis once impregnated, can produce young, which will continue to produce others without any fresh impregnation, even to the fifth progeny; afterwards a new impregnation must take place. See *APHIS*.

The male insects, like male hawks, are always smaller than the females.

In the propagation of their species they are remarkably careful; so that it is with the greatest difficulty the flies are kept from depositing their eggs on fresh meat, the cabbage butterfly from laying them on cabbage, and other insects from depositing them in the several places peculiar to each. The scarabæus pilularius and carnifex, are deserving of our attention, as they afford a mutual assistance to each other: for when the female has laid her eggs in a little ball of dung, the males with their feet, which are axiform, assist the female to roll it to some suitable place; as Aristotle and Pliny formerly, and Loeßing has lately, observed.

It is very wonderful to observe, that in the coccus and oniscus, the female has no sooner brought forth her young, than she is devoured by it; and that the sphex should be able so readily to kill the caterpillar of a moth, then bury it in the earth, and there deposit her eggs in it. Nor can we without admiration behold the same species of aphis, which was viviparous in the summer, become oviparous in the autumn.

Almost innumerable examples might be brought of the singularities in the eggs of insects: we shall, however, only mention those of the hemerobius, which are deposited on a footstalk; those of the phalæna neustria, which are placed regularly in a ring round the branch of some tree; and the compound eggs of the blatta.

SECT. III. *Metamorphoses of Insects.*

THERE are no insects, except those of the aptera class, but what are continually undergoing some transformation. Insects change first from the (ovum) egg, into the (larva) caterpillar or maggot; then into the (pupa) chrysalis; and lastly into the (imago) fly or perfect state. During each of those changes, their appearance differs as much as night and day.

The insect, as soon as it came out of the egg, was by former entomologists called *eruca*; but as this is synonymous with the botanic name *sisymbrium*, it was changed by Linnæus for the term

Larva; a name expressive of the insect's being, in this state, as it were masked, having its true appearance concealed. Under this mask or skin the entire insect, such as it afterwards appears when perfect, lies concealed, enveloped only in its tender wings, and putting on a soft and pulpy appearance; inasmuch that Swammerdam was able to demonstrate the butterfly with its wings to exist in a caterpillar,

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Changes of insects. though it bore but a faint resemblance to its future perfection. The insect, therefore, in this state, undergoes no other alteration but the change of its skin. The larvæ are, for the most part, larger than the insect, when perfect, and are very voracious. The caterpillar of the cabbage-butterfly eats double what it would seem to require from its size; but its growth is not adequate to its voracity.

Pupa. The insect in this state was formerly called *chrysalis*, or *aurelia*: but as the appearance of gilding is confined to a few butterflies only, the term of *pupa* has been adopted in its stead; because the lepidoptera, especially, resemble an infant in swaddling clothes; and in this state all, except those of the hemiptera class, take no nourishment.

Imago, is the third state. This name is given by Linnæus to this third change, in which the insect appears in its proper shape and colours; and as it undergoes no more transformations, it is called *perfect*. In this state it flies, is capable of propagating its species, and receives true antennæ; which before, in most insects, were scarce apparent.

As the shape of the pupa is different in different classes of insects, it assumes different names; thus it is called

Coarctata, when it is round, and as it were turned, without the least resemblance of the structure of the insect; as in the diptera.

Obtecla, when it consists as it were of two parts, one of which surrounds the head and thorax, and the other the abdomen.

Incompleta, when they have wings and feet, but are not capable of moving them; as in most of the hymenoptera.

Seniocompleta, in which they walk or run, but have only the rudiments of wings.

Completa, in which they immediately obtain the perfect form of the insect, without undergoing any more change: as in those of the aptera class, except only the flea. The bed-bug also belongs to this class.

The spider undergoes frequent transformations, though only in the colour of its skin. The crustaceous insects, as crabs, lobsters, &c. yearly cast their shells, as their growth would otherwise be impeded.

The scolopendri, when young, have fewer feet than when they are full grown.

All insects, as soon as they undergo the third change, are arrived at their full growth; nor do we find any difference in the size of the same species of insect in the same countries, unless, during its caterpillar state, it has not had a sufficiency of proper food.

SECT IV. *Classification of Insects.*

As insects are endowed with the various powers of creeping, flying, and swimming, there is scarce any place, however remote and obscure, in which they are not to be found. The great confusion which appeared to the ancients to arise from their number, made them never dream of reducing them to any system. Swammerdam, that indefatigable inquirer into nature, observed that their metamorphoses were divided by nature into several states or orders. Their external appearance also carried with it some mark of distinction: so that entomologists called all those of the coleoptera

4 R.

class

Classifica-
tion of In-
sects.

class *Scarabæi* (beetles); those of the lepidoptera *Papilionæ*; and those of the gymnoptera class that had two wings only, *Musca* (flies); those of the same class that had four wings, were called *Apes* (bees). No farther progress was made in the systematic part of this science till the time of Linnæus. He was the first that undertook to determine the genera, and assign them their proper characters, in the *Système Naturel*; and thus reduced this science to a systematic form. This system, in subsequent editions, was considerably enriched and amended by him, inasmuch that the science of insects now shines forth in its full lustre. He it was who first instituted natural orders, and reduced them into genera by expressive names; determined an infinite number of species in the *Fauna Suecica* and *Museum Regiæ*; collected with incredible pains the synonymous names of the various authors who had written on them; and lastly, added their descriptions, and the places in which they were to be found. So that the system of this illustrious author will lead any person, without the assistance of a master, for the most part, easily to ascertain the name of any insect he may meet with. Before his time scarce any more than 200 insects were known; whereas, in the last edition of his system, he has determined the names of nearly 3000 distinct species; though this is not the sixth part of the number that is now known.

ORDERS. The class of insects is divided by Linnæus into seven orders.

Plate
CLXXXII.

1. The *Coleoptera* (from *κωλεος* a sheath, and *πτερον* a wing), are such insects as have crustaceous elytra or shells, which shut together, and form a longitudinal future down the back of the insect; as the beetle (*buprestis ignita*), fig. 16.

2. *Hemiptera* (from *ημισυ* half, and *πτερον* a wing), have their upper wings usually half crustaceous and half membranaceous, not divided by a longitudinal future, but incumbent on each other; as the cimex, fig. 17.

3. *Lepidoptera* (from *λεπιδ* a scale, and *πτερον* a wing), are insects having four wings, covered with fine scales in the form of powder or meal; as in the butterfly (*papilio antiopa*), fig. 18.

4. *Neuroptera*, from *νευρον* a nerve, and *πτερον* a wing,) have four membranous transparent naked wings, generally like network; as in the *panorpa coa*, fig. 19.

5. *Hymenoptera* (from *υμεν* a membrane, and *πτερον* a wing), are insects with four membranous wings, tail furnished with a sting; as in the *tenthredo*, fig. 20.

6. *Diptera* (from *δυω* two, and *πτερον* a wing), are such as have only two wings, and poisers; as in the fly (*musca*), fig. 21.

7. *Aptera* (from *α* without, and *πτερον* a wing), insects having no wings. This last division contains scorpions, spiders, crabs, lobsters, &c. See ARANEA, CANCER, &c.

GENERA. To insert here the characters of all the different genera which may be found in Linnæus's Syst. Nat. would be unnecessary. It will be sufficient to enumerate some new genera mentioned by subsequent systematic writers, that, by being acquainted with the subtle distinctions on which they are built, the student may avoid running into confusion. It is among the moderns only that genera of this kind are to be met with, and new names given them. To remove this difficulty, we shall first enumerate the names

of those authors which are synonymous with those of Linnæus.

New GENERA of authors synonymous with those of Linnæus.

Linnæus's Names.

Lucanus
Hister
Byrrhus
Mylabris
Attelabus
Silpha
Bruchus
Ptinus
Chrysomela
Hispa
Cantharis
Buprestis
Carabus
Myrmeleon
Sirex

Names of other Authors.

Platyceros
Attelabus
Anthrenus cistela
Larva Scop.
Clerus
Peltis
Mylabris
Byrrhus
Galericula
Crispiferis
Cicindela
Cucujus
Buprestis
Formica-leo
Uroceros.

New genera of authors.

Copris. Scarabæus absque scutello

Bostrius. Dermestes capecinus

Cistela. Byrrhus pilula

Rhinomancer. Attelabus rostro producto fere cuculionis.

Anthribus. Silpha

Bruchus. Ptinus Fur ob spinas thoracis

Melolontha. Chrysomela cylindrica

Altica. — saltatoria

Diaperis. — fungorum

Pyrochora. Cantharis

Telephorus. Cantharis

Cantharis. Meloë alata

Cerocoma. Meloë shafferi

Notaxis. Meloë monoceros

Prionus. Cerambyx thoracis margine denticulato

Stenocoris. Leptura thorace spinosa

Hydrophilus. Dytiscus antennis clavatis

Mylabris. Necydalis minor

Acridium. Gryllus muticus

Locusta. — tettigonia

Tettigonia. Cicada

Corixa. Notonecta

Naucocoris. Nepa

Perla. Hemerobius cauda bifida

Libelluloides. Myrmeleon antennis capitatis

Crabro. Tenthredo antennis clavatis

Pterophorus. Phalæna alucita

Bibio. Tipula thorace spinosa

Stomoxoides. Asilus bucca inflata

Stratonymus. Musca

Nemotelus. Musca.

Volucella. Musca.

These genera appear to be in a great measure like those which were introduced into botany by the followers of Rivinus. Paying too little regard to nature, they disunited natural genera, on account of the most trifling distinctions. This made their continuance in the science of very short duration; our business here is not to suppose, but to examine, what nature will allow of, and what she will not. Knowledge of this kind, built on opinion only, will not stand. We are therefore to look into the science with great accuracy; and the larva of the insect, its manner of changing, and other

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sects.

other things of moment, are to be known, before we presume to form a new genus.

Coining of new names, and changing of one old one for another, has been the source of the greatest confusion. Thus, in order to reduce the cicindela and carabus to the same genus, *buprestis* has been adopted for the generic name; but as that genus had long ago received a very different application, it was changed for that of *cucujus*.

Again, that the officinal cantharides might be ranged among the cerambyces, the cantharides have been removed from the genus of meloë (to which they naturally belong), and referred to the genus of cicindela, obtaining thus a new name. And so of many others.

Thus also, to mention no more, how needless and rash was it to separate the acridium and locusta from the genus of gryllus, the crabro from the tenthredines, and the mylabris from the necydalis!

TRIVIAL NAMES. The trivial names placed under their respective genera will occasion little or no controversy; they are current like money, and of the same utility as the proper names of men, Peter or Paul, &c. Insects living on vegetables should receive their names from the particular plants on which they mostly feed, as they are preferable to all others. Thus the names of the *phalæna mori*, &c. are excellent; and when we are able to give such to insects, the old ones are to be discarded. But we are to be cautious of not being too hasty in our judgment in this respect; as insects, when they cannot get their favourite food, will often eat other plants. Thus the silk-worm, for want of mulberry leaves, will eat those of lettuce, though it will not thrive so well on them.

Many other instances of the invention of trivial names will be met with in the *Systema Naturæ*, particularly among the butterflies and moths. To prevent confusion from the great number of species which constitute the genus of phalæna, they are distributed into sections, and distinguished by the terms of *bombyces*, *noctuæ*, *geometræ*, *tortrices*, *pyralides*, *tineæ*, and *alucitæ*. The bombyces and noctuæ, which are so much alike, that the females of the bombyces are with great difficulty distinguished from the noctuæ, are named promiscuously.

All those of the geometræ have their names terminating in *aria* and *ata*, according as their antennæ are setaceous or pectinated. The tortrices, in *aria*; the pyralides, in *alis*; the tineæ, in *ella*; and the alucitæ, in *daçyla*: so that it is evident from the termination itself to what section the insect is to be referred.

It were to be wished that similar institutions could

be formed throughout the whole science, as here the name itself serves to distinguish the insect.

Butterflies are divided into sections, by the names of *Equites*, *Heliconii*, *Danai*, *Nymphales*, and *Plebeii*.

In such a multitude of butterflies, the greatest part of which are foreign and extra European, and to whose food and manner of life we are utter strangers, it was impossible to give significant trivial names. Linnæus, therefore, by way of simile, has taken the names of the *Equites* from the Trojan history. These consist, as it were, of two troops or bodies; of which one contains the fable, and as it were mourning nobles, having red or bloody spots at the basis of their wings. These receive names from the Trojan nobles; and as Priam was king of Troy, the most splendid among these bear his name. The other body, ornamented with a variety of gay colours, are distinguished by the names of the Grecian heroes; and as in both armies there were kings as well as officers of an inferior rank, those elegant butterflies, whose hinder wings resembled tails, were distinguished by some royal name. Thus when Paris is mentioned (knowing from history that he was a Trojan, and of royal blood), we find him among those of the first section; that is, those of a fable colour, spotted in the breast with red, and having their hinder-wings resembling tails. When Agamemnon is named, we remember him to be a noble Greek, and find him among those nobles which have variegated and swallow-tailed wings. But when Ne-reus is spoken of, we readily know him to belong to the last section, with wings having no tails.

The second class, which contains the *Heliconii*, derive their names from the muses, as Urania. The names of the sons and daughters of Danaus are bestowed on the third section. And as these species are subdivided into two other sections, viz. the white and parti-coloured, the metaphor is so conducted, that the white ones preserve the names of the daughters of Danaus, and the parti-coloured ones those of the sons of Egyptus: so that it is evident from the name itself to what section the butterfly is to be referred.

The names of the fourth section, *Nymphales*, are taken from various nymphs of antiquity; and those of the fifth section, *Plebeii*, are selected from different men among the ancients whose names are worthy of remembrance: so that by this means a knowledge of the ancients may be interspersed, and this agreeable science be made doubly pleasing.

Those, therefore, who shall find new lepidoptera, and give them new names, will do well to follow this method, unless it be apparent what food the insect chiefly subsists on.

E N T

Entrepas,
Entring.

ENTREPAS, in the manege, a broken pace or going, that is neither walk nor trot, but has somewhat of an amble.

This is a pace or gait of such horses as have no reins or back, and go upon their shoulders; or, of such as are spoiled in their limbs.

ENTRING-LADDERS, in a ship, are of two sorts; one used by the vessel's sides, in a harbour, or in fair weather, for persons to go in and out of the ship: the other is made of ropes, with small staves for steps; and

E N T

is hung out of the gallery to enter into the boat, or to Entrochus, come aboard the ship, when the sea runs so high that they durst not bring the boat to the ship's side for fear of staving it.

ENTROCHUS, in natural history, a genus of extraneous fossils, usually of about an inch in length, and made up of a number of round joints, which, when separate and loose, are called *trochita*: they are composed of the same kind of plated spar with the fossil shells of the echini, which is usually of a bluish-grey colour,

Entry
||
Envoy.

and very bright where fresh-broken; they are all striated from the centre to the circumference, and have a cavity in the middle. See Plate CLXXXII.

The entrochi are found of all sizes, from that of a pin's head to a finger's length, and the thickness of one's middle finger; and are plainly of marine origin, having often sea-shells adhering to them. They seem to be the petrified arms of that singular species of the sea star-fish, called *stella arborefcens*.

They are esteemed very powerful diuretics, and prescribed in nephritic cases with good success; the dose being as much of the powder as will lie on a shilling.

ENTRY, in law, signifies taking possession of lands or tenements, where a person has a right so to do.

ENTRY of an Heir, in Scots law, that form of law by which an heir vests in himself a proper title to his predecessor's estate.

Bill of ENTRY, in commerce. See BILL.

In making entries inwards, it is usual for merchants to include all the goods they have on board the same ship in one bill, though sometimes they may happen to be upwards of 20 several kinds: and in case the goods are short entered, additional or post entries are now allowed; though formerly the goods, so entered, were forfeited. As to bills of entry outwards, or including goods to be exported, upon delivering them, and paying the customs, you will receive a small piece of parchment called a *cocket*, which testifies your payment thereof, and all duties for such goods.

If several sorts of goods are exported at once, of which some are free, and others pay customs; the exporter must have two cockets, and therefore must make two entries; one for the goods that pay, and the other for the goods that do not pay custom.

Entries of goods, on which a drawback is allowed, must likewise contain the name of the ship in which the goods were imported, the importer's name, and time of entry inwards. The entry being thus made, and an oath taken that the customs for those goods were paid as the law directs, you must carry it to the collector and comptroller, or their deputies; who, after examining their books, will grant warrant, which must be given to the surveyor, searcher, or land-waiter, for them to certify the quantity of goods; after which the certificate must be brought back to the collector and comptroller, or their deputies, and oath made that the said goods are really shipped, and not landed again in any part of Great Britain.

ENVELOPE, in fortification, a work of earth, sometimes in form of a simple parapet, and at others like a small rampart with a parapet: it is raised sometimes on the ditch, and sometimes beyond it.

ENVIRONNE', in heraldry, signifies surrounded with other things: thus, they say, a lion environné with so many bezants. See BEZANT.

ENUMERATION, an account of several things, in which mention is made of every particular article.

ENUMERATION, in rhetoric, a part of peroration; in which the orator, collecting the scattered heads of what has been delivered throughout the whole, makes a brief and artful relation or recapitulation thereof.

ENVOY, a person deputed to negotiate some affair with any foreign prince or state. Those sent from the courts of Britain, France, Spain, &c. to any petty prince or state, such as the princes of Germany, the

republics of Venice, Genoa, &c. go in quality of envoys, not ambassadors; and such a character only do those persons bear, who go from any of the principal courts of Europe to another, when the affair they go upon is not very solemn or important. There are envoys ordinary and extraordinary, as well as ambassadors; they are equally under the protection of the law of nations, and enjoy all the privileges of ambassadors; only differing from them in this, that the same ceremonies are not performed to them.

ENVY, in ethics; pain felt, and malignity conceived, at the sight of excellence or happiness in another. See EMULATION.

EON, or ÆON. See ÆON.

EONIANS, in church history, the followers of Eon, a wild fanatic of the province of Bretagne, in the 12th century, whose brain was disordered. He concluded from the resemblance between *eum*, in the form for exercising malignant spirits, viz. *Per eum, qui venturus est judicare vivos & mortuos*, and his own name Eon, that he was the son of God, and ordained to judge the quick and dead. Eon, however, was solemnly condemned by the council at Rheims in 1148, at which Pope Eugenius III. presided, and ended his days in a miserable prison. He left behind him a number of followers and adherents, whom persecution and death so weakly and cruelly employed, could not persuade to abandon his cause, or to renounce an absurdity which, says Mosheim, one would think could never have gained credit but in such a place as Bedlam.

EORIA, in mythology, a feast celebrated by the Athenians in honour of Erigonus, who, by way of punishment, for their not avenging the death of his father Icarus, engaged the gods to inflict the curse on their daughters, that they should love men who never returned their passion. The feast was instituted by the order of Apollo.

EOSTRE, in mythology, a Saxon goddess to whom they sacrificed in the month of April, called the month of *Eostra*; and thence the name *Easter*, which the Saxons retained after their conversion to Christianity, applying it to the festival celebrated in commemoration of our Saviour's resurrection.

EPACRIS, in botany: A genus of the monogynia order, belonging to the pentandria class of plants. The calyx is a five-parted perianthium; the corolla monopetalous and tubular; the stamina five very short filaments; the pericarpium a roundish, depressed, quinquelocular, quinquevalvular, gaping capsule; the seeds are numerous and very small.

EPACTS, in chronology, the excesses of the solar month above the lunar synodical month, and of the solar year above the lunar year of twelve synodical months; or of several solar months above as many synodical months, and several solar years above as many dozen of synodical months.

The epacts, then, are either *annual* or *menstrual*.

Menstrual epacts are the excesses of the civil or kalendar month above the lunar month. Suppose, *e. gr.* it were new-moon on the first day of January; since the lunar month is 29 days 12h. 44' 3", and the month of January contains 31 days, the menstrual epact is 1 day 11h. 15' 57".

Annual epacts are the excesses of the solar year above the lunar. Hence, as the Julian solar year is 365 days 6h. and the Julian lunar year 354 days 8h.

Envy
||
Epacts.

Epacts. 48' 38", the annual epact will be 10 days 21 h. 11' 22"; that is, nearly 11 days. Consequently the epact of 2 years is 22 days; of 3 years, 33 days; or rather 3, since 30 days make an *embolismic* or intercalary month.

Thus the epact of 4 years is 4 days, and so of the rest; and thus, every 19th year, the epact becomes 30 or 0; consequently the 20th year the epact is 11 again; and so the cycle of epacts expires with the golden number, or lunar cycle of 19 years, and begins with the same, as in the following table:

Gold. Numb.	Epacts.	Gold. Numb.	Epacts.	Gold. Numb.	Epacts.
1	XI	7	XVII	13	XXIII
2	XXII	8	XXVIII	14	IV
3	III	9	IX	15	XV
4	XIV	10	XX	16	XXVI
5	XXV	11	I	17	VIII
6	VI	12	XII	18	XIX
				19	XXX

Again, as the new moons are the same, that is, as they fall on the same day every 19 years, so the difference between the lunar and solar years is the same every 19 years. And because the said difference is always to be added to the lunar year, in order to adjust or make it equal to the solar year; hence the said difference respectively belonging to each year of the moon's cycle is called the *epact of the said year*, that is, the number to be added to the said year, to make it equal to the solar year; the word being formed from the Greek *επαγω*, *induco*, *intercalo*.

Upon this mutual respect between the cycle of the moon and the cycle of the epacts, is founded this rule for finding the Julian epact, belonging to any year of the moon's cycle. Multiply the year given of the moon's cycle into 11; and if the product be less than 30, it is the epact sought; if the product be greater than 30, divide it by 30, and the remainder of the dividend is the epact. For instance, I would know the epact for the year 1712, which is the third year of the moon's cycle. Wherefore 3 is the epact for 1712; for $11 \times 3 = 33$, and 33 being divided by 30, there is left 3 of the dividend for the epact. But the difference of the Julian and Gregorian years being equal to the excess of the solar above the lunar year, or 11 days, it happens that the Gregorian epact for one year is the same with the Julian epact for the preceding year.

EPAMINONDAS, a celebrated Theban, the son of Polymnus, and one of the greatest captains of antiquity. He learned philosophy and music under Lyfias, a Pythagorean philosopher; and was from his infancy inured to all the exercises of body and mind. He was learned, generous, well-skilled in war, brave, modest, and prudent; and had such a regard for truth, that he would not tell a falsehood even in jest. He served first under the Lacedemonians; saved the life of Pelopidas their chief, who received in a battle seven or eight wounds; and contracted a strict friendship with that general, which lasted till his death. At his persuasions, Pelopidas delivered the city of Thebes from the yoke of the Spartans, who had rendered themselves masters of Cadmea, which occasioned a bloody war between the two nations. Epaminondas was made general of the Thebans; on which he gained the cele-

brated battle of Leuctra, in which Cleombrotus, the valiant king of Sparta, was killed. He then ravaged the enemy's country, and caused the city of Messina to be rebuilt and peopled. At length, the command of the army was given to another, because Epaminondas had kept his troops in the field four months longer than he had been ordered by the people; but, instead of retiring in disgust, he now served as a common soldier, and distinguished himself by so many brave actions, that the Thebans, ashamed of having deprived him of the command, restored him to his post, in order to carry the war into Thessaly, where his arms were always victorious. A war breaking out between the Elians and the inhabitants of Mantinea, the Thebans took the part of the former. Epaminondas then resolved to endeavour to surprise Sparta and Mantinea; but not succeeding, he gave the enemy battle, in which he received a mortal wound with a javelin, the bearded iron remaining in the wound. Knowing that it could not be drawn out without occasioning immediate death, he would not suffer it to be touched, but continued to give his orders: and on his being told, that the enemy were entirely defeated, "I have lived long enough (he cried), since I die without being conquered;" and at the same time he plucked the javelin from his wound, and expired, 363 B. C.

EPANALEPSIS. See ORATORY. n° 73.

EPANODOS. *Ibid.* n° 75.

EPANORTHOSIS. *Ibid.* n° 86.

EPARER, in the manege, signifies the flinging of a horse, or his jerking and striking with his hind-legs.

EPAULEMENT, in fortification, a work raised to cover sidewise, is either of earth, gabions, or fascines loaded with earth. The epaulements of the places of arms for the cavalry, at the entrance of the trenches, are generally of fascines mixed with earth.

EPAULETTES, are a kind of shoulder-knots chosen for the soldiers, which are to be of the colour of the facing, with a narrow yellow or white tape round it, and worsted fringe: those for the officers are made of gold or silver lace, with a rich fringe; they are badges of distinction worn on one or both shoulders. Those of the dragoon-guards, horse, and dragoons, are worn on the left shoulder: the light dragoons, and officers of grenadiers, have one on each shoulder: those of the battalion wear one on the right shoulder only, which is to be made of embroidery or lace with a gold or silver fringe. Those of the royal regiment of artillery are to be gold and embroidery, with gold fringe on scarlet cloth, and worn on the right shoulder.

EPENTHESIS, in grammar, the interposition or insertion of a letter or syllable in the middle of a word; as *alituum*, for *alitum*; *relligio*, for *religio*; *induperator*, for *imperator*, &c.

EPEUS, of the line of Endymion, the inventor of the battering ram, an engine of great service in sieges to make a breach. He is thought to have built the Trojan horse, and to have founded the city Metapontum.

EPHA, or **EPHAN**, in Jewish antiquity, a measure for things dry, equal to 3 pecks and 3 pints.

EPHEBÆUM, in antiquity, the place where the ephebi or youth exercised; or, as some say, where those who

Epanalepsis
||
Ephebæum

Ephēbi
||
Ephemera.

who designed to exercise met, and agreed what kind of exercise they should contend in, and what should be the victor's reward.

EPHEBI, among the Athenians, a designation given to their young men when they arrived at 18 years of age, at which time they had their names entered in a public register.

EPHEDRA, in botany, a genus of the monodelphia order, belonging to the diœcia class of plants; and in the natural method ranking under the 5th order, *Coniferae*. The male calyx is bifid; there is no corolla, but seven stamens; four antheræ inferior; three superior. The female calyx is bipartite, and five-fold, one upon another; there is no corolla; there are two pistils, and two seeds covered by the calyx, resembling a berry.

EPHEMERA, from *ἡμερα*, "a day;" a diary fever, or a fever of one day's continuance only. In this case, such a heat as attends an excess of wine, a pulse somewhat full and quick, but soft and regular, a slight headach, a nausea, and restlessness, are all the symptoms, and which terminate without any sensible evacuation. If it continue unto the third day, it is not a diary fever; and if the constitution is very dry, an hectic is to be dreaded.

EPHEMERA, the *Day fly*, in zoology, a genus belonging to the order of neuroptera. It has no teeth or palpi; there are two large protuberances above the eyes; the wings are erect, the two hind ones being largest; and the tail is bristly. These flies, who take their name from the shortness of their life, are distinguished into several species. Some live several days, others do not take flight till the setting of the sun, and live not to see the rising of that luminary. Some exist but one hour, others but half that time; in which short period they comply with the call of nature. With respect to those who live several days, there is a peculiarity observed, incident to themselves alone.

Barbut's
Insects.

Plate
CLXXXII.

They have to cast off one slough more, an operation which sometimes takes 24 hours to complete. To bring this about, they cling fast to a tree. The ephemera, before they flutter in air, have in some manner been fishes. They remain in the states of larva and chrysalis for one, two, or three years. The chrysalis only differs from the larva by there being observable on its back cases for wings. Both have on their sides small fringes of hair, which, when put into motion, serve them as fins. Nothing can be more curious than the plying of those little oars in the water. Their abdomen is terminated, as well as in their state of flies, by three threads. These larvæ scoop themselves out dwellings in the banks of rivers; and they are small tubes made like siphons, the one serving for an entrance, the other affording them an outlet. The banks of some rivers are often perforated with them. When the waters decrease, they dig fresh holes lower down, in order to enjoy their element the water. The season and hour when the chrysalids of the different species of the ephemera turn into flies, maintain a kind of regularity. The heat, the rise or fall of the waters, accelerate, however, or postpone their final display. The ephemera of the Rhine appear in the air two hours before sunset. These flies are hatched almost all at the same instant in such numbers as to darken the air. The most early of those on the Marne and Seine in France do not begin to fly till two hours

after the setting of the sun, towards the middle of August. They are seen fluttering and sporting on the brink of their tomb. The glare of light attracts them, round which they perform a thousand circles with amazing regularity. Their coming together for the purpose of generation can only be surmised, the shortness of their life requiring that all its functions should be proportionable to their duration. Some naturalists have been of opinion, that the males impregnated the eggs after the manner of fishes. The females, by the help of the threads of their tail and the flapping of their wings, support themselves on the surface of the water, and in that almost upright situation drop their eggs in clusters. One single female will lay 700 or 800 eggs, which sink to the bottom. The larvæ that escape from the voraciousness of the fishes, set about the construction of habitations to shelter them from every kind of danger. When the flies have propagated, they are seen to die and fall by heaps. The land and water are strewed with them to a considerable thickness. The fishermen consider these multitudes of destroyed insects as manna for the fishes.

EPHEMERIDES, in astronomy, tables calculated by astronomers, showing the present state of the heavens for every day at noon; that is, the places where in all the planets are found at that time. It is from these tables that the eclipses, conjunctions, and aspects of the planets, are determined; horoscopes or celestial schemes constructed, &c. We have ephemerides of Origan, Kepler, Argoli, Heckerus, Mezzaracchis, Wing, De la Hire, Parker, &c. S. Cassini has calculated ephemerides of the sidera medicæ or satellites of Jupiter, which are of good use in determining the longitude.

In England, the Nautical Almanac, or Astronomical Ephemeris, published annually by anticipation, under the direction of the commissioners of longitude, is the most considerable. In France, celestial ephemerides have been published by M. Desplaces every ten years, from 1715 to 1745: they were afterwards continued by the Abbé Caille, with many additions; of which an account may be seen in the History of the Academy of Sciences for 1743. The Academy of Sciences have likewise published annually, from the beginning of the present century, a kind of ephemeris, under the title of *Connaissance des Temps*.

EPHESUS, a city of antiquity, much celebrated on account of its temple of Diana, and for being the most famous mart or staple town of Hither Asia. Ephesus was in ancient times the metropolis of all Asia. Stephenus gives it the title of *Epiphaneitate*, or *most illustrious*; and Pliny styles it the ornament of Asia. The ancient city stood about 50 miles south of Smyrna, near the mouth of the river Cayster, and the shore of the Icarian sea, which is a bay of the Ægean; but as it has been so often destroyed and rebuilt, it is no easy matter to determine the precise place. Most of our modern travellers are of opinion, that the ancient city stood more to the south than the present; which they argue from the ruins that still remain. Ephesus was, in ancient times, known by the names of *Alopes*, *Ortygia*, *Morges*, *Smyrna*, *Trachæa*, *Samornion*, and *Ptela*. It was called *Ephesus*, according to Heraclides, from the Greek word *ephesus*, signifying *permission*; because Hercules (says he) permitted the Amazons to live and build a city in that place. Others tell

Ephemerides,
Ephesus.

Ephesus us, that Ephesus was the name of the Amazon that founded the city; for Pliny, Justin, and Orosius, unanimously affirm that it was built by an Amazon; while others bestow this honour upon Androclus, the son of Codrus, king of Athens, who was the chief of the Ionians that settled in Asia. But in matters of so early a date, it is impossible to come at the truth, and therefore not worth our while to dwell on such fruitless inquiries. What we know for certain is, that the city, which in the Roman times was the metropolis of all Asia, acknowledged Lyfimachus for its founder; for that prince, having caused the ancient city to be entirely demolished, rebuilt, at a vast expence, a new one, in a place more convenient, and nearer the temple. Strabo tells us, that, as the inhabitants showed a great reluctance to quit their ancient habitations, Lyfimachus caused all the drains that conveyed the water into the neighbouring fens and the Cayster to be privately stopped up; whereby the city being on the first violent rains in great part laid under water, and many of the inhabitants drowned, they were glad to abandon the ancient and retire to the new city. This new Ephesus was greatly damaged by an earthquake in the reign of Tiberius, but by that emperor repaired and adorned with several stately buildings, of which there are now but few ruins to be seen, and scarce any thing worthy of ancient Ephesus. The aqueduct, part of which is still standing, is generally believed to have been the work of the Greek emperors; the pillars which support the arches are of fine marble, and higher or lower as the level of the water required. This aqueduct served to convey water into the city from the spring of Halitee, mentioned by Pausanias. The gate, now called by the inhabitants, for what reason we know not, *the Gate of Persecution*, is remarkable for three bas-reliefs on the mould of an exquisite taste. The port, of which so many medals have been struck, is at present but an open road, and not much frequented. The Cayster was formerly navigable, and afforded a safe place for ships to ride in, but is now almost choked up with sand.

But the chief ornament of Ephesus was the temple of Diana, built at the common charge of all the states in Asia, and for its structure, size, and furniture, accounted among the wonders of the world. This great edifice was situated at the foot of a mountain, and at the head of a marsh; which place they chose, if we believe Pliny, as the least subject to earthquakes. This site doubled the charges; for they were obliged to be at a vast expence in making drains to convey the water that came down the hill into the morass and the Cayster. Philo Byzantius tells us, that in this work they used such a quantity of stone, as almost exhausted all the quarries in the country; and these drains or vaults are what the present inhabitants take for a labyrinth. To secure the foundations of the conduits or sewers, which were to bear a building of such a prodigious weight, they laid beds of charcoal, says Pliny, well rammed, and upon them others of wool. Two hundred and twenty years, Pliny says 400, were spent in building this wonderful temple by all Asia. It was 425 feet in length, and 200 in breadth, supported by 127 marble pillars, 70 feet high, of which 27 were most curiously carved, and the rest polished. These pillars were the works of so many kings, and the bas-

reliefs of one were done by Scopas, the most famous sculptor of antiquity; the altar was almost wholly the work of Praxiteles. Cheiromocrates, who built the city of Alexandria, and offered to form Mount Athos into a statue of Alexander, was the architect employed on this occasion. The temple enjoyed the privilege of an asylum, which at first extended to a furlong, was afterwards enlarged by Mithridates to a bow-shot, and doubled by Marc Antony, so that it took in part of the city: but Tiberius, to put a stop to the many abuses and disorders that attend privileges of this kind, revoked them all, and declared that no man guilty of any wicked or dishonest action should escape justice, though he fled to the altar itself.

The priests who officiated in this temple were held in great esteem, and trusted with the care of sacred virgins, or priestesses, but not till they were made eunuchs. They were called *Estiatores* and *Essene*, had a particular diet, and were not allowed by their constitutions to go into any private house. They were maintained with the profits accruing from the lake Selinusius, and another that fell into it, which must have been very considerable, since they erected a golden statue to one Artemidorus, who being sent to Rome, recovered them after they had been seized by the farmers of the public revenues. All the Ionians resorted yearly to Ephesus, with their wives and children, where they solemnized the festival of Diana with great pomp and magnificence, making on that occasion rich offerings to the goddess, and valuable presents to her priests. The *asfiarchæ*, mentioned by St Luke, were, according to Beza, those priests whose peculiar province it was to regulate the public sports that were annually performed at Ephesus in honour of Diana: they were maintained with the collections made during the sports; for all Asia flocked to see them. The great Diana of the Ephesians, as she was styled by her blind adorers, was, according to Pliny, a small statue of ebony, made by one Canitia, though commonly believed to have been sent down from heaven by Jupiter. This statue was first placed in a nich, which, as we are told, the Amazons caused to be made in the trunk of an elm. Such was the first rise of the veneration that was paid to Diana in this place. In process of time the veneration for the goddess daily increasing among the inhabitants of Asia, a most stately and magnificent temple was built near the place where the elm stood, and the statue of the goddess placed in it. This was the first temple; but not quite so sumptuous as that which we have described, though reckoned, as well as the second, among the wonders of the world. The second, being that above described, was remaining in Pliny's time, and in Strabo's; and is supposed to have been destroyed in the reign of Constantine, pursuant to the edict by which that emperor commanded all the temples of the heathens to be thrown down and demolished: the former was burnt the same day that Alexander was born, by one Erostratus, who owned on the rack, that the only thing which had prompted him to destroy so excellent a work, was the desire of transmitting his name to future ages. Whereupon the common council of Asia made a decree, forbidding any one to name him; but this prohibition served only to make his name more memorable, such a remarkable extravagance, or rather madness, being taken notice of by all the historians who

Ephesus. who have written of those times. Alexander offered to rebuild the temple at his own expence, provided the Ephesians would agree to put his name on the front; but they rejected his offer in such a manner as prevented the resentment of that vain prince, telling him, that "it was not fit one god should build a temple to another." The pillars, and other materials that had been saved out of the flames, were sold, and also the jewels of the Ephesian women, who on that occasion willingly parted with them; and the sum raised from thence served for the carrying on of the work till other contributions came in, which, in a short time, amounted to an immense treasure. This is the temple which Strabo, Pliny, and other Roman writers speak of. It stood between the city and the port, and was built, or rather finished, as Livy tells us, in the reign of king Servius. Of this wonderful structure there is nothing at present remaining but some ruins, and a few broken pillars.

The Ionians first settled at Ephesus under the conduct of Androclus, who drove out the Carians and Leleges, by whom those places were possessed at his arrival. The city, whither built by him, as Strabo affirms, or by one Cræsus or Ephesus, long before the Ionic migration, as others maintain, became soon the metropolis of Ionia. It was at first governed by Androclus, and his descendants, who assumed the royal title, and exercised the regal authority over the new colony: whence, even in Strabo's time, the posterity of Androclus were stiled kings, and allowed to wear a scarlet robe, with a sceptre, and all the ensigns of the royal dignity. In process of time, a new form of government was introduced, and a senate established; but when, or on what occasion, this change happened, we know not. This kind of government continued till the time of Pythagoras, who lived before Cyrus the Great, and was one of the most cruel and inhuman tyrants we read of in history; for, having driven out the senate, and taken all the power into his own hands, he filled the city with blood and rapine, not sparing even those who fled to the temple of Diana for shelter. Pythagoras was succeeded by Pindarus, who bore the same sway in the city; but treated the citizens with more humanity. In his time Ephesus being besieged by Cræsus king of Lydia, he advised the inhabitants to devote their city to Diana, and fasten the wall, by a rope, to the pillars of her temple. They followed his advice, and were, from reverence to the goddess, not only treated with great kindness by Cræsus, but restored to their former liberty. Pindarus being obliged to resign his power, retired to Peloponnesus. He was, according to Ælian, grandson to Alyattes king of Lydia, and Cræsus's nephew. The other tyrants of Ephesus mentioned in history are, Athenagoras, Comas, Aristarchus, and Hegesias; of whom the last was expelled by Alexander, who, coming to Ephesus, after having defeated the Persians on the banks of the Granicus, bestowed upon Diana all the tributes which the Ephesians had paid to the Persians, and established a democracy in the city. In the war between Mithridates and the Romans, they sided with the former, and, by his direction, massacred all the Romans that resided in their city; for which barbarity they were severely fined, and reduced

Nº 118.

almost to beggary by Sylla, but afterwards treated kindly, and suffered to live according to their own laws, as is plain from several ancient inscriptions and medals. The Ephesians were much addicted to superstition, sorcery, and curious arts, as the scripture styles them; whence came the proverb "Ephesian letters," signifying all sorts of spells or charms.

In the time of the apostle Paul, Ephesus retained a great deal of its ancient grandeur. But it was a ruinous place, when the emperor Justinian filled Constantinople with its statues, and raised his church of St Sophia upon its columns. Since then it has been almost quite exhausted. Towards the end of the 11th century, a Turkish pirate, named *Tangripermes*, settled there. But the Greek admiral, John Ducas, defeated him in a bloody battle, and pursued the flying Turks up the Mæander. In 1306, it was among the places which suffered from the exactions of the grand-duke Roger; and two years after, it surrendered to sultan Sayfan, who, to prevent future insurrections, removed most of the inhabitants to Tyriæum, where they were massacred. Ephesus appears to have subsisted as an inconsiderable place for some time. But now, the Ephesians are only a few Greek peasants, living in extreme wretchedness, dependence, and insensibility; the representatives of an illustrious people, and inhabiting the wreck of their greatness; some, the substructions of the glorious edifices which they raised; some, beneath the vaults of the Stadium, once the crowded scene of their diversions; and some, by the abrupt precipice, in the sepulchres which received their ashes.

EPHETÆ (from *ἐπιμύει*, "I send forth"), in antiquity, a sort of magistrates among the Athenians, instituted by king Demophoon, to take cognizance of murder, man-slaughter, and chance-medley.

Their number was 100, whereof 50 were Athenians, and 50 Argians: they were not admitted to the post till upwards of 50 years of age. Draco new modelled it, excluded the Argians out of it, and made it to consist of 51 Athenians, each above 50 years of age: Ubbo Emmius de Rep. Athen. says, he transferred to them part of the jurisdiction of the Areopagites. See AREOPAGUS.

EPHOD, in Jewish antiquity, one part of the priestly habit; being a kind of girdle, which, brought from behind the neck over the two shoulders, and hanging down before, was put across the stomach, then carried round the waist, and made use of as a girdle to the tunic.—There were two sorts of ephods, one of plain linen for the priests, and the other embroidered for the high priest.

EPHORI, in Grecian antiquity, magistrates established in ancient Sparta to balance the regal power. The authority of the ephori was very great. They sometimes expelled and even put to death the kings, and abolished or suspended the power of the other magistrates, calling them to account at pleasure. There were five of them, others say nine. They presided in the public shows and festivals. They were entrusted with the public treasure; made war and peace; and were so absolute, that Aristotle makes their government equal to the prerogative of a monarchy. They were established by Lycurgus, according to the generality of authors: though this is denied by others, who date their

their

Ephorus
||
Epibate-
rium.

their origin 130 years after the time of that legislator. Thus Plutarch, in his Life of Cleomenes, ascribes their institution to Theopompus king of Sparta; which is also confirmed by the authority of Aristotle.

EPHORUS, an orator and historian of Cumæ in Æolia, about 352 years before Christ. He was disciple to Isocrates, by whose advice he wrote an history which gave an account of all the actions and battles that had happened between the Greeks and barbarians for 750 years. It was greatly esteemed by the ancients; but is now lost.

EPHRAIM (anc. geog.), one of the divisions of Palestine by tribes: Ephraim and the half tribe of Manasseh are blended together by the sacred writer; and it only appears that Ephraim occupied the more southern, and the half tribe of Manasseh the more northern parts, but both seem to have extended from the Jordan to the sea. Ephraim also denotes a kingdom, on the separation of the 10 tribes from the house of David, called also the kingdom of Israel and of Samaria.

EPHRATA, a small town of Pennsylvania in America, and the principal settlement of the religious sect called *Dunkards* or *Tunkers*. See *TUNKERS*.

EPHREM (Syrus), an ancient Christian writer, in the fourth century, deacon of Edessa, was born at Nisibe, in Syria. He was greatly esteemed by St Basil, St Gregory, Nyssen, and other great men. He wrote against the opinions of Sabellius, Arius, Apollonarius, the Manichees, &c. and acquired such reputation by his virtue and his works, that he was called the *doctor and the prophet of the Syrians*. He died in 378. The best editions of his works are, that of Oxford, in 1708, in folio, and that of Rome, from 1732 to 1736, in Syriac, Greek, and Latin, 6 vols folio.

EPHYDOR, in antiquity, an officer in the Athenian courts of justice, who was to provide the plaintiff and defendant with equal water hour-glasses. When the glass was run out, they were not permitted to speak any farther; and, therefore, we find them very careful not to lose or mispend one drop of their water. Whilst the laws quoted by them were reciting, or if any other business happened to intervene, they gave orders that the glass should be stopped.

EPIBATÆ, *ἑπιβαταί*, among the Greeks, marines or soldiers who served on board the ships of war. They were armed in the same manner as the land-forces, only that more of them wore full or heavy armour.

EPIBATERION, a poetical composition, in use among the ancient Greeks. When any person of condition and quality returned home after a long absence or journey into another country, he called together his friends and fellow-citizens, and made them a speech, or rehearsed them a copy of verses, wherein he returned solemn thanks to the immortal gods for his happy return; and ended with an address by way of compliment to his fellow-citizens.—These verses made what the Greeks call *ἐπιβατήριον*, *epibaterium*, of *ἐπιβαίνω*, "I go abroad". At going away they had another, called *ἀποβατήριον*.

EPIBATERIUM, in botany: A genus of the hexandria order, belonging to the monœcia class of plants. In the male flowers the calyx is a double

perianthium, the outward one with six leaves, very small; the inner one three-leaved, and three times larger than the former, with egg-shaped leaves. The corolla has six petals smaller than the interior calyx and roundish. The stamina are six capillary filaments, crooked, and as long as the petals; the antheræ are roundish. The female flowers are on the same plant. The calyx and corolla are as in the male. The pericarpium consists of three roundish, monospermous plums; the seed a kidney-shaped compressed nut, somewhat furrowed.

EPIC, or HEROIC, *Poem*, a poem expressed in narration, formed upon a story partly real and partly feigned; representing, in a sublime style, some signal and fortunate action, distinguished by a variety of great events, to form the morals, and affect the mind with the love of heroic virtue.

We may distinguish three parts of the definition, namely, the matter, the form, and the end. The matter includes the action of the fable, under which are ranged the incidents, episodes, characters, morals, and machinery. The form comprehends the way or manner of the narration, whether by the poet himself, or by any persons introduced, whose discourses are related: to this branch likewise belong the moving of the passions, the descriptions, discourses, sentiments, thoughts, style, and versification; and besides these, the similes, tropes, figures, and, in short, all the ornaments and decorations of the poem. The end is to improve our morals and increase our virtue. See *POETRY*.

EPICEDION (formed of *ἐπὶ* upon, and *κένος* funeral), in the Greek and Latin poetry, a poem, or poetical composition, on the death of a person.—At the obsequies of any man of figure, there were three kinds of discourses usually made; that rehearsed at his *buftum* or funeral pile, was called *nenia*; that engraven on his tomb, *epitaph*; and that spoken in the ceremony of his funeral, *epicedion*. We have two beautiful epicedions in Virgil, that of Euryalus and that of Pallas.

EPICEDIUM, in ancient poetry, a poem rehearsed during the funeral solemnity of persons of distinction.

EPICHARMUS, an ancient poet and philosopher, born in Sicily, was a scholar of Pythagoras. He is said to have introduced comedy at Syracuse in the reign of Hiero. Horace commends Plautus for imitating him, in following the chace of the intrigue so closely as not to give the readers or spectators time to trouble themselves with doubts concerning the discovery. He wrote likewise treatises concerning philosophy and medicine; but none of his works have been preserved. He died aged 90, according to Laertius, who has preserved four verses inscribed on his statue.

EPICHIROTONIA, among the Athenians. It was ordained by Solon, that once every year the laws should be carefully revised and examined; and if any of them were found unsuitable to the present state of affairs, they should be repealed. This was called *ἐπιχειροτονία τῶν νόμων*, from the manner of giving their suffrages by holding up their hands. See a farther account of this custom in Pott. *Archæol. Græc. lib. i. cap. 26. tom. i. p. 142.*

EPICOENE, in grammar, a term applied to nouns,

Epic
||
Epicœne.

Epicurean, which, under the same gender and termination, mark indifferently the male and female species. Such in Latin is *aquila*, *vespertilio*, &c. which signify equally a male or female eagle or bat.

Grammarians distinguish between *epicæne* and *common*. A noun is said to be common of two kinds, when it may be joined either with a masculine or a feminine article; and *epicæne*, when it is always joined to some of the two articles, and yet signifies both genders.

EPICUREAN, a celebrated Stoic philosopher, born at Hierapolis in Phrygia, in the first century, was the slave of Epaphroditus, a freedman and one of Nero's guard. Domitian banishing all philosophers from Rome, about the year 94, Epictetus retired to Nicopolis in Epirus, where he died in a very advanced age; and after his death, the earthen lamp he made use of sold for 3000 drachmas. He was a man of great modesty; which was eminent in his own practice, as well as in his recommendation to others: hence he used to say, "That there is no need of adorning a man's house with rich hangings or paintings, since the most graceful furniture is temperance and modesty, which are lasting ornaments, and will never be the worse for wearing." Of all the ancient philosophers, he seems to have made the nearest approaches to the Christian morality, and to have had the most just ideas of God and providence. He always possessed a cool and serene mind, unruffled by passion; and was used to say, that the whole of moral philosophy was included in these words, *support* and *abstain*. One day, his master Epaphroditus strove in a frolic to wrench his leg; when Epictetus said, with a smile, and free from any emotion, "If you go on, you will certainly break my leg:" but the former redoubling his effort, and striking it with all his strength, he at last broke the bone; when all the return Epictetus made was, "Did not I tell you, Sir, that you would break my leg?" No man was more expert at reducing the rigour of the maxims of the Stoics into practice. He conformed himself strictly, both in his discourse and behaviour, to the manners of Socrates and Zeno. He waged continual war with fancy and fortune; and it is an excellence peculiar to himself, that he admitted all the severity of the Stoics without their sourness, and reformed Stoicism as well as professed it; and besides his vindicating the immortality of the soul as strenuously as Socrates or any Stoic of them all, he declared openly against self-murder, the lawfulness of which was maintained by the rest of the sect. Arrian, his disciple, wrote a large account of his life and death, which is lost; and preserved four books of his discourses and his Enchiridion, of which there have been several editions in Greek and Latin; and, in 1758, a translation of them into English was published by the learned and ingenious Miss Carter.

EPICUREAN PHILOSOPHY, the doctrine or system of philosophy maintained by Epicurus and his followers.

His philosophy consisted of three parts; canonical, physical, and ethereal. The first was about the canons or rules of judging. The censure which Tully passes upon him for his despising logic, will hold true only with regard to the logic of the Stoics, which he could not approve of, as being too full of nicety and quirk. Epicurus was not acquainted with the analytical method of division and argumentation, nor was he so curious in modes and formation as the Stoics. Soundness and

simplicity of sense, assisted with some natural reflections, was all his art. His search after truth proceeded only by the senses; to the evidence of which he gave so great a certainty, that he considered them as an infallible rule of truth, and termed them the *first natural light of mankind*.

In the second part of this philosophy he laid down atoms, space, and gravity, as the first principles of all things: he did not deny the existence of God, but thought it beneath his majesty to concern himself with human affairs; he held him a blessed immortal Being, having no affairs of his own to take care of, and above meddling with those of others.

As to his ethics, he made the supreme good of man to consist in pleasure, and consequently supreme evil in pain. Nature itself, says he, teaches us this truth; and prompts us from our birth to procure whatever gives us pleasure, and avoid what gives us pain. To this end he proposes a remedy against the sharpness of pain: this was to divert the mind from it, by turning our whole attention upon the pleasures we have formerly enjoyed. He held that the wise man must be happy, as long as he is wise: the pain, not depriving him of his wisdom, cannot deprive him of his happiness.

There is nothing that has a fairer show of honesty than the moral doctrine of Epicurus. Gassendus pretends, that the pleasure in which this philosopher has fixed the sovereign good, was nothing else but the highest tranquillity of mind, in conjunction with the most perfect health of body: but Tully, Horace, and Plutarch, as well as almost all the fathers of the church, give us a very different representation: indeed the nature of this pleasure, in which the chief happiness is supposed to be seated, is a grand problem in the morals of Epicurus. Hence there were two kinds of Epicureans, the rigid and the remiss: the first were those who understood Epicurus's notion of pleasure in the best sense, and placed all their happiness in the pure pleasures of the mind, resulting from the practice of virtue: the loose or remiss Epicureans, taking the words of that philosopher in a gross sense, placed all their happiness in bodily pleasures or debauchery.

EPICURUS, the greatest philosopher of his age, was born at Gargettium in Attica, about 340 B. C. in the 109th Olympiad. He settled at Athens in a fine garden he had bought; where he lived with his friends in great tranquillity, and educated a great number of disciples. They lived all in common with their master. The respect which his followers paid to his memory is admirable: his school was never divided, but his doctrine was followed as an oracle. His birth-day was still kept in Pliny's time; the month he was born in was observed as a continued festival; and they placed his picture every where. He wrote a great many books, and valued himself upon making no quotations. He raised the atomical system to a great reputation, though he was not the inventor of it, but had only made some change in that of Democritus. As to his doctrine concerning the supreme good or happiness, it was very liable to be misrepresented, and some ill effects proceeded from thence, which discredited his sect. He was charged with perverting the worship of the gods, and inciting men to debauchery; but he did not forget himself on this occasion: he published his opinions to the whole world; he wrote some books of devotion; recommended the veneration of the gods, so-

Epicycle
||
Epidaureus

briety, and chastity; and it is certain that he lived in an exemplary manner, and conformably to the rules of philosophical wisdom and frugality. Timocrites, a deserter of his sect, spoke very scandalously of him. Gassendus has given us all he could collect from the ancients concerning the person and doctrine of this philosopher; who died of a suppression of urine, aged 72.

EPICYCLE, in the ancient astronomy, a little circle whose centre is in the circumference of a greater circle: or it is a small orb or sphere, which being fixed in the deferent of a planet, is carried along with it; and yet, by his own peculiar motion, carries the planet fastened to it round its proper centre.

It was by means of epicycles that Ptolemy and his followers solved the various phenomena of the planets, but more especially their stations and retrogradations.

EPICYCLOID, in geometry, a curve generated by the revolution of the periphery of a circle, along the convex or concave side of the periphery of another circle.

EPICYEMA, among physicians, denotes a suppletion; being a false conception or mole happening after the birth of a regular fetus.

EPIDAUURUM, EPIDAUURUS, or EPITAUURUM, (anc. geog.), a town of Dalmatia, on the Adriatic, built the same year, as is said, with Dyrrachium, 430 years after the destruction of Troy: A considerable town formerly, but now reduced to a small village, called *Ragusi Vecchio*; distant six miles from the modern Ragusi. E. Long. 19°. Lat. 42°, 20'.

EPIDAUURUS (anc. geog.), a town of Argolis, in Peloponnesus, on the Saronic bay, to the south of the promontory *Spiræum*; called *sacred*, because of the religious veneration paid to Æsculapius, whose temple stood at the distance of five miles from the town. The Romans, during a pestilence, being advised to convey the god to Rome, sent a ship, with a solemn embassy, for his conveyance: but while the Epidaurians were in suspense to part with him, a huge serpent sailed to the ship; and, being taken for the god, was carried to Rome in great solemnity. Epidaurus stood in a recess of the bay, fronting the east; and was fortified by nature, being inclosed by high mountains reaching to the sea, and rendering it difficult of access. It had several temples, and in the acropolis or citadel was a remarkable statue of Minerva. The site is now called *Epi-thavro*. The traces are indistinct, and it has probably been long deserted. The harbour of Epidaurus is long. Its periplus or circuit was 15 stadia or near two miles. The entrance is between mountains, and on a small rocky peninsula on the left hand are ruins of a modern fortress. This, it seems, was the point on which a temple of Juno stood. It is frequented by vessels for wood or corn. The grove of Æsculapius was inclosed by mountains, within which all the sacrifices as well of the Epidaurians as of strangers were consumed. One was called *Titthion*; and on this the god when an infant was said to have been exposed, and to have been suckled by a she-goat. He was a great physician, and his temple was always crowded with sick persons. Beyond it was the dormitory of the suppliants; and near it, a circular edifice called the *Tholus*, built by Polycletus, of white marble, worth seeing. The grove, besides other temples, was adorn-

ed with a portico, and a fountain remarkable for its roof and decorations. The bath of Æsculapius was one of the benefactions of Antoninus Pius, while a Roman senator; as was also a house for the reception of pregnant women and dying persons, who before were removed out of the inclosure, to be delivered or to expire in the open air. The remains are heaps of stones, pieces of brick wall, and scattered fragments of marble; besides some churches or rather piles of rubbish mis-called, being destitute of doors, roofs, or any kind of ornament. The statue of Æsculapius was half as big as that of Jupiter Olympius at Athens. It was made of ivory and gold, and, as the inscription proved, by Thrasymedes son of Arignotus of Paros. He was represented sitting, holding his staff, with one hand on the head of a serpent, and a dog lying by him. Two Argive heroes, Bellerophon combating with the monster Chimæra, and Perseus severing the head of Medusa, were carved on the throne. Many tablets described the cures performed by the deity, yet he had not escaped contumely and robbery. Dionysius deprived him of his golden beard, affirming it was very unseemly in him to appear in that manner when his father Apollo was always seen with his face smooth. Sylla amassed the precious offerings belonging to him and to Apollo and Jupiter at Delphi and Olympia, to pay his army before Athens. The marks in the walls testified that a great number had been plucked down. A few fragments of white marble exquisitely carved occur in the heap of the temple. The inclosure of the temple once abounded in inscriptions. In the second century six marbles remained, on which were written in the Doric dialect the names of men and women who had been patients of the god, with the distemper each had laboured under, and the remedies he had directed. Dr Chandler found only a couple of votive inscriptions, and two pedestals of statues, one of which represented a Roman, and was erected by the city of the Epidaurians. The Stadium was near the temple. It was of earth, as most in Greece were. At the upper end are seats of stone, but these were continued along the sides only a few yards. A vaulted passage leading underneath into the area, now choked up, was a private way by which the Agonothetæ or presidents with the priests and persons of distinction entered. Two large cisterns or reservoirs remain, made by Antoninus for the reception of rain-water. Beyond them is a dry water-course; and in the mountain-side on the right-hand are the marble seats of the theatre, overgrown with bushes. The springs and wells by the ruins are now supposed to possess many excellent properties. To these and a good air, Dr Chandler thinks, with the recreations of the theatre and of the stadium, and to the medicinal knowledge and experience of the priests, may be attributed both the recovery of the sick and the reputation of Æsculapius.

EPIDAUURUS, with the surname *Limera*, to distinguish it from the Epidaurus of Argolis; called so, either from its meadows or its commodious harbours (Stephanus, Apollodorus): a town of Laconica, on the Ionian sea, to the south of the Sinus Argolicus, situated where now Molvasia stands, in the Morea. E. Long. 23. 30. Lat. 35. 40.

EPIDEMIA, in Grecian antiquity, festivals kept in honour of Apollo and Diana, at the stated seasons

Epidaureus,
Epidennia.

Epidemic when those deities, who could not be present every where, were supposed to visit different places, in order to receive the vows of their adorers.

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Epidotæ.

EPIDEMIC, among physicians, an epithet of diseases which at certain times are popular, attacking great numbers at or near the same time.

EPIDENDRUM, in botany: A genus of the diandria order, belonging to the gynandria class of plants; and in the natural method ranking under the seventh order, *Orchideæ*. The nectarium is turbinated, oblique, and reflexed. This is the plant which produces the fruit called *vanilla*, and which is used in the making of chocolate. It is a native of Mexico, and also of some parts of the East Indies. It is a parasitic plant; the leaves of which greatly resemble the vine, and are about 18 inches long and three inches broad. The flowers are of a white colour intermixed with stripes of red and yellow. When these fall off, they are quickly succeeded by the pods, which at first are green, but afterwards, as they ripen, become yellow, and are gathered for use. The pods of the best vanilla are long, slender, and well filled with seeds. If opened when fresh, the cavity of the pod is found to contain a humid substance that is black, oily, and balsamic, of such a strong smell, that it frequently causes headaches, and even a sort of temporary intoxication. The season for gathering the pods begins about the latter end of September, and lasts till the end of December. They are dried in the shade; and when dry and fit for keeping, they are rubbed externally with a little oil of cocoa or calba, to render them supple, or preserve them the better, and to prevent them from becoming too dry or brittle. The use of this fruit is only for perfuming chocolate. In New Spain it is reckoned unwholesome; and therefore never used: but in England and other countries of Europe, it is a constant ingredient; and perhaps its noxious qualities may be corrected by the sea-air. In those countries where they grow, the plants are very easily propagated by cuttings. In this country they require to be kept in a stove, and also to be placed near some American tree, round which they may climb for their support.

EPIDERMIS, in anatomy, the cuticle or scarf-skin. See *ANATOMY*, n° 74. The word is formed of the Greek *ἐπί*, on, over; and *δέρμα*, skin.

EPIDICASIA, among the Athenians. Daughters inheriting their parents estate, were obliged to marry their nearest relation; which gave occasion to persons of the same family to go to law with one another, each pretending to be more nearly allied to the heiress than the rest. The suit was called *ἐπιδικασία* *δική*: and the virgin, about whom the relations contested, *ἐπιδίκατος*.

EPIDIDYMIS, in anatomy, a little round body, on the back of each testicle; called also *parastata*. See *ANATOMY*, p. 738, col. 1.

EPIGÆA, in botany: A genus of the monogynia order, belonging to the decandria class of plants; and in the natural method ranking under the 18th order, *Bicornes*.

EPIDOTÆ, certain deities who presided over the growth of children. They were worshipped by the Lacedæmonians, and chiefly invoked by those who were persecuted by the ghosts of the dead, &c.

EPIGASTRIC REGION, a part or subdivision of the abdomen. See *ANATOMY*, n° 88.

EPIGLOTTIS, in anatomy, one of the cartilages of the larynx or wind-pipe. See *ANATOMY*, n° 104, par. 3. and n° 116.

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Epigram.

EPIGONI, the sons and descendants of the Grecian heroes who were killed in the first Theban war. The war of the Epigoni is famous in ancient history. It was undertaken ten years after the first. The sons of those that had perished in the first war, resolved to avenge the death of their fathers, and marched against Thebes, under the command of Thersander; or, according to others, of Alcæon the son of Amphiaraus, about 1307 years before Christ. The Argives were assisted by the Corinthians, the people of Messenia, Arcadia, and Megara. The Thebans had engaged all their neighbours in their quarrel, as in one common cause. These two hostile armies met and engaged on the banks of the Glissas. The fight was obstinate and bloody, but victory declared for the Epigoni, and some of the Thebans fled to Illyricum with Leodamas their general, while others retired into Thebes, where they were soon besieged, and forced to surrender. In this war Ægialeus was the only one who was killed, and his father Adrastus was the only one who escaped alive in the first war. This whole war, as Pausanias observes, was written in verse; and Callinus, who quotes some of the verses, ascribes them to Homer, which opinion has been adopted by many writers. "For my part (continues the geographer), I own, that next to the Iliad and Odyssey of Homer, I have never seen a finer poem." The descendants of the veteran Macedonians, who served under Alexander the Great, and who had children by Asiatic women, were also called *Epigoni*, (Justin.)

EPIGRAM, in poetry, a short poem in verse, treating only of one thing, and ending with some lively, ingenious, and natural thought or point. The word is formed of *ἐπιγραμμή* *inscription*, of *ἐπιγράφειν* to inscribe or write upon.

Epigrams then, originally, signify inscriptions, and they derive their origin from those inscriptions placed by the ancients on their tombs, statues, temples, triumphal arches, &c. These, at first, were only simple monograms: afterwards, increasing their length, they made them in verse, to be the more easily retained: Herodotus, and others, have transmitted to us several of them. Such little poems retained the name of epigrams, even after the design of their first institution was varied, and people began to use them for the relation of little facts and accidents, the characterizing of persons, &c. The point or turn is a quality much insisted on by the critics, who require the epigram constantly to close with something poignant and unexpected, to which all the rest of the composition is only preparatory; while others, on the contrary, exclude the point, and require the thought to be equally diffused throughout the poem, without laying the whole stress on the close: the former is usually Martial's practice, and the latter that of Catullus.

The Greek epigrams have scarce any thing of the point or briskness of the Latin ones: those collected in the Anthology, have most of them a remarkable air of ease and simplicity, attended with something just and witty;

Epigraphe
||
Epimedi-
um.

witty; such as we find in a sensible peasant, or a child that has wit. They have nothing that bites, but something that tickles. Though they want the salt of Martial, yet to a good taste they are not insipid; except a few of them, which are quite flat and spiritless. However, the general faintness and delicacy of the pleasantries in them, has given occasion for a Greek epigram, or *epigram à la Greque*, to denote, among the French, an epigram void of salt or sharpness.

The epigram admits of great variety of subjects: some are made to praise, and others to satirize; which last are much the easiest, ill-nature serving instead of point and wit. Boileau's epigrams are all satires on one or another; those of des Reaux are all made in honour of his friends; and those of Mad. Scudery are so many eulogies. The epigram being only a single thought, it would be ridiculous to express it in a great number of verses.

EPIGRAPHE, among antiquarians, denotes the inscription of a building, pointing out the time when, the persons by whom, the uses, and the like, for which it was erected.

EPILEPSY, in medicine, the same with what is otherwise called the *falling-sickness*, from the patient's falling suddenly to the ground. See *MEDICINE-Index*.

EPILOBIUM, the WILLOW-HERB, in botany: A genus of the monogynia order, belonging to the octandria class of plants; and in the natural method ranking under the 17th order, *Calycanthemæ*. The calyx is quadrifid; the petals four; the capsule oblong inferior; the seeds pappous or downy. There are seven species, all of them natives of Britain. They grow in marshes, or under hedges in moist and shady places; having blossoms generally of a red colour, and sometimes of considerable beauty. The most remarkable is the hirsutum, commonly called *codlins and cream*. The top-shoots of this plant have a very delicate fragrance; but so transitory, that before they have been gathered five minutes, it is no longer perceptible. Horses, sheep, and goats eat this plant; cows are not fond of it; swine refuse it. An infusion of the leaves of another species, the angustifolium, or rosebay willow-herb, has an intoxicating quality, as the inhabitants of Kamtschatka have learned. These people also eat the white young shoots which creep under the ground, and have a sort of ale brewed from the dried pith of it. The down of the seeds has been lately manufactured by mixing it with cotton or beaver's hair.

EPILOGUE, in oratory, the end or conclusion of a discourse, ordinarily containing a recapitulation of the principal matters delivered.

EPILOGUE, in dramatic poetry, a speech addressed to the audience, after the play is over, by one of the principal actors therein; usually containing some reflections on certain incidents in the play, especially those in the part of the person that speaks it; and having somewhat of pleasantries, intended to compose the passions raised in the course of the representation: A practice which is ridiculed by the *Spectator*; and compared to a merry jig upon the organ after a good sermon, to wipe away any impressions that might have been made thereby, and send the people away just as they came.

EPIMEDIUM, BARREN-WORT, in botany: A genus of the monogynia order, belonging to the tetran-

dria class of plants; and in the natural method ranking under the 24th order, *Corydales*. There are four nectaria, cup-shaped, and lying on the petals. The corolla is tetrapetalous, the calyx dropping off. The seed-vessel is a pod. There is only one species, viz. the alpinum. It is a low herbaceous plant, with a creeping root, having many stalks about nine inches high, each of which has three flowers composed of four leaves placed in the form of a cross. They are of a reddish colour, with yellow stripes on the border.

EPIMENIDES, an ancient poet and philosopher, was born at Gnosus in Crete. Contrary to the custom of his country, he always wore his hair long; which, according to some, was because he was ashamed of being thought a Cretan: and indeed he does not seem to have had a high opinion of his countrymen, if that verse cited by St Paul be, as it is generally believed to be, his; "The Cretans are always liars, evil beasts, slow bellies." Many stories are related of him, too wonderful to merit attention; however, his reputation was so great over all Greece, that he was there esteemed a favourite of the gods. The Athenians being afflicted with the plague, and commanded by the oracle to make a solemn lustration of the city, sent Nicias, the son of Niceratus, with a ship to Crete, to desire Epimenides to come to them. He accepted their invitation, accompanied the messengers to Athens, performed the lustration of the city, and the plague ceased. Here he contracted an acquaintance with Solon, whom he privately instructed in the proper methods for the regulation of the Athenian commonwealth. Having finished his business at Athens, the citizens offered him many valuable presents and high honours, and appointed a ship to carry him back to Crete: but he returned their presents, and would accept of nothing except a little branch of the sacred olive preserved in the citadel; and desired the Athenians to enter into an alliance with the Gnosians. Having obtained this, he returned to Crete; where he died soon after, aged 157 years; or as the Cretans, consistently with their character, pretended, 299. He was a great poet, and wrote 5000 verses on "the genealogy of the gods," 6500 "on the building of the ship Argos and Jason's expedition to Colchis," and 4000 "concerning Minos and Rhadamanthus." He wrote also in prose, "Concerning sacrifices and the commonwealth of Crete." St Jerom likewise mentions his "book of oracles and responses." The Lacedemonians procured his body, and preserved it among them by the advice of an oracle; and Plutarch tells us, that he was reckoned the seventh wise man by those who refused to admit Pericles into the number.

EPIMETHEUS, a son of Japetus and Clymene, one of the Oceanides, who inconsiderately married Pandora, by whom he had Pyrrha, the wife of Deucalion. He had the curiosity to open the box which Pandora had brought with her, and from thence issued a train of evils, which from that moment have never ceased to afflict the human race. Hope was the only one which remained at the bottom of the box, not having a sufficient time to escape, and it is she alone which comforts men under misfortunes. Epimetheus was changed into a monkey by the gods, and sent into the island Pitheculia.

EPIPHANIUS (St), an ancient father of the church;

Epimenide
||
Epiphanius.

Epiphany church, born at Befanducan, a village in Palettine, about the year 332. He founded a monastery near the place of his birth, and presided over it. He was afterwards elected bishop of Salamis; when he sided with Paulinus against Meletius, and ordained in Palestine, Paulinian the brother of St Jerom; on which a contest arose between him and John bishop of Jerusalem. He afterwards called a council in the island of Cyprus, in which he procured a prohibition of the reading of Origen's writings; and made use of all his endeavours to prevail on Theophilus bishop of Alexandria to engage St Chrysostom to declare in favour of that decree: but not meeting with success, he went himself to Constantinople, where he would not have any conversation with St Chrysostom; and formed the design of entering the church of the apostles, to publish his condemnation of Origen; but being informed of the danger to which he would be exposed, he resolved to return to Cyprus; but died at sea, in the year 403. His works were printed in Greek, at Basil, 1544, in folio; and were afterwards translated into Latin, in which language they have been often reprinted. Petavius revised and corrected the Greek text by two manuscripts, and published it together with a new translation at Paris in 1622. This edition was reprinted at Cologne in 1682.

EPIPHANY, a Christian festival, otherwise called the *Manifestation of Christ to the Gentiles*, observed on the sixth of January, in honour of the appearance of our Saviour to the three magi or wise men, who came to adore him and bring him presents. The feast of epiphany was not originally a distinct festival; but made a part of that of the nativity of Christ, which being celebrated 12 days, the first and last of which were high or chief days of solemnity, either of these might properly be called *epiphany*, as that word signifies the appearance of Christ in the world.

The word in the original Greek, *ἐπιφάνεια*, signifies *appearance* or *apparition*; and was applied, as some critics will have it, to this feast, on account of the star which appeared to the magi.—St Jerom and St Chrysostom take the epiphany for the day of our Saviour's baptism, when he was declared to men by the voice, *Hic est filius meus dilectus, in quo mihi complacui*: "This is my beloved Son, in whom I am well pleased." And accordingly it is still observed by the Coptæ and Ethiopians in that view. Others contend, that the feast of Christmas, or the nativity of our Saviour, was held in divers churches on this day; which had the denomination *epiphany*, or *appearance*, by reason of our Saviour's first appearance on earth at that time. And it must be allowed, that the word is used among the ancient Greek fathers, not for the appearance of the star to the magi, but for that of our Saviour to the world: In which sense, St Paul uses the word *epiphania*, in his second epistle to Timothy, i. 10.

EPIPHONEMA. See ORATORY, n° 96.

EPIPHORA, in medicine, a preternatural defluxion of the eyes, when they continually discharge a sharp ferous humour, which excoriates the cheeks.

EPIPHYSIS, in anatomy. See ANATOMY, p. 677. col. 2.

EPIPLOCELE, in medicine, is a kind of hernia or rupture, in which the omentum subsides into the scrotum.

EPIPLOOMPHALON, in medicine, an hernia *Epiploomphalon* umbilicalis, proceeding from the omentum falling into the region of the umbilicus or navel.

EPIPLOON. See OMENTUM.

EPIRUS, a district of ancient Greece, bounded on the east by Etolia, on the west by the Adriatic, on the north by Thessaly and Macedon, and on the south by the Ionian sea. This country was anciently governed by its own princes, in which state it made a very considerable figure. The country, according to Josephus, was first peopled by Dodanim the son of Javan and grandson of Japhet. The people were very warlike: but they continued in their savage state long after their neighbours were civilized; whence the Islanders used to threaten their offenders with transportation to Epirus. Their horses were in great request among the ancients, as well as the dogs produced in one of the divisions called *Molossus*; and hence these dogs were called by the Romans *Molossi*.

The history of Epirus commences with the reign of Pyrrhus the son of Achilles by Deidamia the daughter of Lycomedes king of Scyros. He is said to have behaved with great bravery at the siege of Troy; but it would appear that he behaved with no less barbarity. After the city was taken, he is said to have killed old king Priam with his own hand; to have thrown Astyanax the son of Hector and Andromache headlong from an high tower; and sacrificed Polyxena the daughter of Priam on the tomb of his father. He carried Andromache with him into Epirus, where he settled by the advice of the famous soothsayer Helenus, one of Priam's sons, who had served during the Trojan war both under his father and himself. The only remarkable period of the history of Epirus is the reign of Pyrrhus II. who made war upon the Romans. He was invited into Italy by the Tarentines; and embarked about 280 B. C. After having escaped many dangers by sea, he landed in that country, and with great difficulty gained a victory over the Romans; but he was afterwards utterly defeated by them †, and obliged to return † See Rome. into his own country. To retrieve his honour, he then undertook an expedition against Macedon; where he overthrew Antigonos, and at last made himself master of the whole kingdom. He then formed a design of subduing all the other Grecian states; but met with such an obstinate resistance at Lacedæmon, that he was obliged to drop the enterprize; and was soon after killed at the siege of Argos by a woman, who from the wall threw a tile upon his head. Deidamia, the grand-daughter of Pyrrhus, was the last that sat on the throne of Epirus. She is said to have been murdered after a short reign; upon which the Epirots formed themselves into a republic.

Under the new form of government Epirus never made any considerable figure, but seems rather to have been dependent on the kingdom of Macedon. The Romans having conquered Philip king of that country, restored the Epirots to their ancient liberty; but they, forgetful of this favour, soon after took up arms in favour of Perseus. As a punishment for this ingratitude, the Romans gave orders to Paulus Emilius, after the reduction of Macedon, to plunder the cities of Epirus, and level them with the ground. This was punctually executed throughout the whole country on the same day and at the same hour. The booty was sold, and each

¹ Epirus, each foot-soldier had 200 denarii, that is, six pounds nine shillings and two pence, and each of the horse the double of this sum. An hundred and fifty thousand men were made slaves, and sold to the best bidder for the benefit of the republic. Nor did the vengeance of Rome stop here; all the cities of Epirus, to the number of 70, were dismantled, and the chief men of the country carried to Rome, where they were tried, and most of them condemned to perpetual imprisonment. After this terrible blow, Epirus never recovered its ancient splendor. Upon the dissolution of the Achæan league, it was made part of the province of Macedon; but when Macedon became a diocese, Epirus was made a province of itself, called the province of *Old Epirus*, to distinguish it from *New Epirus*, another province lying to the east of it. On the division of the empire, it fell to the emperors of the east, and continued under them till the taking of Constantinople by the Latins, when Michael Angelus, a prince nearly related to the Greek emperor, seized on Etolia and Epirus, of which he declared himself despot or prince; and was succeeded by his brother Theodorus, who took several towns from the Latins, and so far enlarged his dominions, that, disdaining the title of *despot*, he assumed that of *emperor*, and was crowned by Demetrius archbishop of Bulgaria. Charles, the last prince of this family, dying without lawful issue, bequeathed Epirus and Acarnania to his natural sons, who were driven out by Amurath the second. Great part of Epirus was afterwards held by the noble family of the Castriots; who, though they were masters of all Albania, yet styled themselves princes of Epirus. Upon the death of the famous George Castriot, surnamed *Scanderbeg*, Epirus fell to the Venetians, who were soon dispossessed of it by the Turks; in whose hands it still continues, being now known by the name of *Albania*, which comprehends the Albania of the ancients, all Epirus, and that part of Dalmatia which is subject to the Turks.

¹ Commencement of the episcopal controversy.

EPISCOPACY, that form of church-government, in which diocesan bishops are established as distinct from and superior to priests or presbyters. We have already observed, that it is a long time since the ministers of religion have been distinguished into different orders, and that it has been much controverted whether the distinction be of divine or human right; whether it was settled in the apostolic age or afterwards. (See BISHOP.) This controversy commenced soon after the Reformation; and has been agitated with great warmth between the *Episcopalians* on the one side, and the *Presbyterians* and *Independents* on the other. Among the protestant churches *abroad*, those which were reformed by *Luther* and his associates are in general *episcopal*; whilst such as follow the doctrines of *Calvin* have for the most part thrown off the order of bishops as one of the corruptions of popery. In *England*, however, the controversy has been considered as of greater importance than on the *Continent*: for it has there been strenuously maintained by one party, that the *episcopal order* is essential to the constitution of the church; and by others, that it is a pernicious encroachment on the rights of men, for which there is no authority in scripture. Though the question has for sometime lain almost dormant, and though we have no desire to revive it; yet as a work of this kind might perhaps be deem-

ed defective, did it contain no account whatever of a *Episcopacy*, controversy which has employed some of the ablest writers of the past and present centuries, we shall give a fair though short view of the chief arguments, by which the advocates of each contending party have endeavoured to support their own cause, leaving our readers to judge for themselves where the truth lies. See INDEPENDENTS and PRESBYTERIANS.

The *Independent* maintains, that under the gospel dispensation there is nothing which bears the smallest resemblance to an exclusive priesthood; that Christ and his apostles constituted no permanent order of ministers in the church; but that any man who has a firm belief in revelation, a principle of sincere and unaffected piety, a capacity for leading devotion and communicating instruction, and a serious inclination to engage in the important employment of promoting the everlasting salvation of mankind; is to all intents and purposes a regular minister of the New Testament, especially if he have an invitation to the pastoral office from some particular society of Christians.

Against this scheme, which supposes the rights of Christians all equal and common, and acknowledges no authority in the church except what may be derived from the election of her members, the Protestant *Episcopalian* reasons in the following manner. He admits, as an undoubted truth, that our blessed Lord gave to none of his immediate followers authority or jurisdiction of such a nature as could interfere with the rights of the civil magistrate, for all such authority was disclaimed by himself: "My kingdom (said he to Pilate) is not of this world:" and to a certain person who asked him to decide a question of property between him and his brother, he replied, "Man, who made me a judge or a divider over you?" But when it is considered, that Christ came into this world to "turn men from darkness to light, and from the power of Satan to the living God; that he gave himself for us, that he might redeem us from all iniquity, and purify to himself a peculiar people zealous of good works;" that of these works many are such as unregenerate humanity has no inclination to perform, and that the doctrines which he revealed are such as human reason could never have discovered; the advocate for episcopacy thinks it was extremely expedient, if not absolutely necessary, that, when he ascended into heaven, he should establish upon earth some authority to illustrate the revelation which he had given, and to enforce obedience to the laws which he had enacted. There is nothing, continues he, more strictly required of Christians, than that they live together in unity, professing the same faith, joining in the same worship, and practising the same virtues. But as men have very different passions, prejudices, and pursuits, such unity would be impossible, were they not linked together in one society under the government of persons authorized to watch over the purity of the faith, to prescribe the forms of public worship, and to explain the nature and inculcate the necessity of the several virtues. The society of Christians, in respect of its unity and organization, is compared to the human body: for "as we have many members in one body, and all members have not the same office; so we being many are one body in Christ, and every one members one of another," (Rom. xii. 4, 5.) It is called the *church*, the *kingdom of heaven*, and

² The Independent scheme.

³ Episcopalian arguments against it.

⁴ Christians linked together in one society called the church, the kingdom of heaven, and the kingdom of God.

Episcopacy and the kingdom of God; and its affairs, like those of every other kingdom, are administered by proper officers in subordination to the ONE LORD, who, "when he ascended up on high, and led captivity captive, gave some apostles, and some prophets, and some pastors and teachers, for the perfecting of the saints, for the work of the ministry, for the edifying of the body of Christ:" (Ephes. iv. 8—13.) That those various orders of ministers were vested with real authority in the church, might be inferred from principles of reason as well as from the dictates of revelation. A society without some sort of government, government without laws, or laws without an executive power, is a direct absurdity. Where there are laws, some must govern, and others be governed; some must command, and others obey; some must direct, and others submit to direction. This is the voice of nature; it is likewise the language of scripture. "Obey them (says the inspired author of the epistle to the Hebrews) who have the rule over you, and submit yourselves: for they watch for your souls as they that must give account." A text which shows that the authority of the ministers of religion was distinct from that of the civil magistrate, whose duty is to watch, *not for the souls*, but for the *lives and properties*, of his subjects.

5
The church
governed
by proper
officers.

6
All Christians
required to
be mem-
bers of the
church.

Of the society thus constituted, it was not, as of a philosophical sect, left to every man's choice whether or not he would become a member. All who embrace the faith of the Redeemer of the world are required to be *baptized*, under the pain of forfeiting the benefits of redemption: but one great purpose for which baptism was instituted, is to be the rite of initiation into the church of Christ; "for by one spirit are we all baptized into one body, whether we be Jews or Gentiles, whether we be bond or free," (1 Cor. xii. 13.) Of baptism, whatever be the importance, it is evident, that to receive it, is not, like the practice of justice, or the veneration of the Supreme Being, a duty resulting from the relations of man to his Creator and fellow-creatures; that its whole efficacy, which in scripture is said to be nothing less than the remission of sins, is derived from *positive institution*; and therefore, that the *external rite* can be of no avail, but when it is administered in the *manner prescribed*, and by a person *authorized* to administer it. That *all* Christians are not vested with this authority, as one of the common privileges of the faith, appears from the commission which our Saviour after his resurrection gave to his apostles. At that period, we are assured that the number of his followers was not less than *five hundred*; yet we find, that to the *eleven disciples* only did "he come and speak, saying, All power is given unto me in heaven and in earth; go ye, therefore, and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghost."

7
All Christians
not
authorized
to admini-
ster the sa-
craments.

Of the 500 disciples there is surely no reason to believe that there were not *many* well qualified to instruct either a Jew or a Gentile in the doctrines of the gospel; and it is certain, that *any one* of them could have washed his convert with water in the name of the Holy Trinity as well as St Peter or St John: but such an unauthorized washing would not have been Christian baptism, nor of equal validity with it, any more than the opinion of a lawyer at the bar is the judgment of a court of justice, or of equal obligation. It is the com-

N^o 118.

mission of the sovereign which gives force to the judge. Episcopacy. ment of the court; it is the commission of Christ which gives validity to baptism. The same reasoning is applicable to the Lord's supper, which, if it be not administered by those who have authority for such administration, cannot be deemed a sacrament of Christ's institution.

These two rites are the external badges of our profession. By the *one*, we are incorporated into that society of which our Redeemer is the head and sovereign: in the celebration of the *other*, we have a right to join, whilst of that society we continue members. But if by an open and scandalous disregard of the precepts of the gospel, we should prove ourselves unworthy of its privileges, the same persons who are authorized to admit us into the church, are likewise vested with authority to cast us out of it; for to them were given "the keys of the kingdom of heaven (or the church), with assurance, that whatsoever they should bind on earth, should be bound in heaven; and whatsoever they should loose on earth, should be loosed in heaven," (Mat. xviii. 18.) As baptism is to be administered so long as there shall be persons to be enlisted under the banners of Christ, and the Lord's Supper to be celebrated so long as it shall be the duty of soldiers to adhere to the standard of their leader and their head; and as it is likewise to be feared that there will never come a time when all Christians shall "walk worthy of the vocation wherewith they are called;" it follows, that this *power of the keys* which was originally given to the apostles, must continue in the church through all ages, even unto the end of the world. But as we have seen, that it was not at first intrusted to *all* the disciples in common, as one of the privileges inseparable from their profession, and as no body of men can possibly *transfer* an authority of which they themselves were *never possessed*; it is certain, that even now it cannot, by the election of one class of Christians, be delegated to another, but must, by some mode of succession, be derived from the apostles, who were sent by Christ as he was sent by his Father. To argue from the origin of *civil* to that of *ecclesiastical* government, although not very uncommon, the Episcopalian deems extremely fallacious. Of the various nations of the world, many of the sovereigns may indeed derive their authority from the suffrages of their subjects; because in a state of nature, every man has an inherent right to defend his life, liberty, and property; and what he possesses in his own person, he may for the good of society transfer to another: but no man is by *nature*, or can *make himself*, a member of the Christian church; and therefore authority to govern that society can be derived only from him by whom it was founded, and who died that he might "gather together in one all the children of God."

8
Christians
as a body
cannot
transfer to
one of their
number an
authority of
which they
were never
possessed.

Against such reasoning as this it hath been urged, that to make institutions, which like baptism and the Lord's supper are generally necessary to the salvation of *all* Christians, depend for their efficacy upon the authority or commission of a *particular order*, appears inconsistent with the wisdom and goodness of God; as by such an economy an intolerable domination would be established over the souls of men, and the purpose for which the Saviour of the world died might be in some degree defeated by the caprice of an ignorant and

9
Authority
to govern
the church
can be de-
rived only
from Christ.

10
An object
would be an-
swered.

6

arbi-

Episcopacy. arbitrary priesthood. The objection is certainly plausible; but the Episcopalian affirms, that either it has no weight, or militates with equal force against all religion, natural as well as revealed, and even against the wisdom of Providence in the government of this world. — In every thing, he observes, relating to their temporal and to their spiritual interests, mankind are all subjected to mutual dependence. The rich depend upon the poor, and the poor upon the rich. An infant neglected from the birth, would barely cry and cease to live; nor is it easily to be conceived, that in the more rigid climates of the earth, a full grown man could provide even the necessaries of mere animal life. Of religion, it is certain that in such a state nothing could be known; for there is not the smallest reason to imagine that any individual of the human race— an *Aristotle*, a *Bacon*, or a *Newton*, had he been left alone from his infancy, without culture and without education,— could ever, by the native vigour of his own mind, have discovered the existence of a God, or that such speculations as lead to that discovery would have employed any portion of his time or his thoughts. Even in civilized society it would be impossible, in the present age, for any man, without the assistance of others, to understand the very first principles of our common Christianity; for the scriptures, which alone contain those principles, are written in languages which are now no where vernacular. In the fidelity of translators, therefore, every illiterate disciple of Jesus must confide, for the truth of those doctrines which constitute the foundation of all his hopes; and as no man ever pretended that the Christian *sacraments* are more necessary to salvation than the Christian *faith*, the Episcopalian fees no impropriety or inconsistency in making those persons receive baptism and the Lord's supper by the ministration of others, who by such ministration must of necessity receive the truths of the gospel.

11
A permanent order of ministers constituted by Christ.

By such arguments as these does the Episcopalian endeavour to prove that Christ constituted some *permanent order of ministers* in the church, to whom in the externals of religion the great body of Christians are commanded to pay obedience; and thus far the Presbyterian agrees with him: but here their agreement ends. They hand in hand attack the Independent with the same weapons, and then proceed to attack each other. The one maintains, that originally the officers of the Christian church were all *presbyters* or *elders* of one order, and vested with *equal powers*; whilst the other holds, that Christ and his apostles appointed *divers orders* of ministers in the church; that of these orders the highest alone was empowered to ordain others; and that therefore obedience, as to those who watch for our souls, can be due only to such as are *episcopally ordained*.

12
The Presbyterian plea.

In behalf of the Presbyterian plea it is urged, that the titles of *bishop* and *presbyter*, being in the New Testament indifferently given to the same persons, cannot be the titles of distinct ecclesiastical officers; which appears still more evident from the ordination of *Timothy*, who, although he was the first *bishop* of Ephesus, received his episcopal character by the imposition of the hands of the *presbytery*.—That one and the same man is, in the New Testament, styled sometimes a *bishop* and sometimes a *presbyter*, cannot be denied; but although every apostolic bishop was therefore undoubtedly a

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presbyter, it does not of course follow, says the Episcopalian, that every presbyter was likewise a bishop. In the *Old Testament*, Aaron and his sons are without any discrimination of order frequently styled *priests*; and in the *New*, both St Peter and St John call themselves *presbyters*, as St Paul, upon one occasion, styles himself a *deacon*— *διακονος*, (Eph. iii. 7.): yet no man ever supposed those apostles to have been such ecclesiastical officers as modern presbyters and deacons; and it is universally known that in the Jewish priesthood there were different orders, and that Aaron was of an order superior to his sons. This being the case, the presbyters, by the laying on of whose hands Timothy was made a bishop, may have been of the same order with St Peter and St John; and if so, it follows that his ordination was *episcopal*. At all events, we are certain, continues the advocate for Episcopacy, that it was not, in the modern sense of the word, *Presbyterian*; for the gift, which in the first epistle is said to have been “given by prophecy with the laying on of the hands of the presbytery,” is in the second said to have been “in him by the putting on of the hands of St Paul.” And here it is worthy of observation, that the preposition used in the former case is *μετα*, which signifies *concurrence* rather than instrumentality; but that in the latter is *δια*, which, as every Greek scholar knows, is prefixed to the *instrumental cause* by which any thing is effected: so that whatever may have been the order of the presbyters who concurred, St Paul appears to have been the *sole* ordainer. But by the confession of all parties, St Paul was a bishop in the highest sense in which that word is ever used; and the powers of the episcopate not being parcelled out among various partners, of whom each possesses only a share, the imposition of his hands was sufficient for every purpose which could have been effected by the hands of the whole college of apostles.

13
Episcopal arguments against it.

It appears, therefore, that from the promiscuous use of the titles *bishop* and *presbyter*, and from the ordination of *Timothy*, nothing can with certainty be concluded on either side of this celebrated question. But if, instead of resting in mere *words*, which, when taken alone and without regard to the context, are almost all of ambiguous signification, we attend to some important *facts* recorded in the New Testament, the Episcopalian thinks we shall in them discover sufficient evidence that the government of the primitive church was prelatial.

During our Saviour's stay upon earth, it is undeniable that he had under him two distinct orders of ministers—the twelve, and the seventy; and after his ascension, immediately before which he had enlarged the powers of the *eleven*, we read of *apostles*, *presbyters*, and *deacons*, in the church. That the presbyters were superior to the deacons, and the apostles superior to both, is universally acknowledged; but it has been said that in scripture we find no intimation that the apostolic order was designed for continuance. A Quaker says the same thing of water-baptism; and the Episcopalian observes, that it would be difficult to point out by what passage of scripture, or what mode of reasoning, those who, upon this plea, reject the apostolic order of Christian ministers, could overthrow the principles upon which the disciples of *George Fox* reject the use of that rite which our Saviour instituted.

14
Three orders of Christian ministers during our Saviour's stay upon earth; and likewise after his ascension into heaven.

4 T

tuted

Episcopacy. tuted for the initiation of mankind into his church.

They were the *eleven* alone to whom Christ said, "Go ye therefore and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghost:" and therefore, although we frequently find presbyters and deacons administering the sacrament of baptism, we must conclude, that as a *judge* administers justice by authority derived from his *sovereign*, so those *inferior officers* of the church administered baptism by authority derived from the *apostles*. Indeed, had they pretended to act by any other authority, it is not easily to be conceived how *their* baptism could have been the baptism instituted by Christ; for it was not with the *external washing* by whomsoever performed, but with the *eleven* and their successors, that he promised to be "always, even unto the end of the world."

15
The apostolic or highest order designed to be permanent.

That the *eleven* did not consider this promise, or the commission with which it was given, as terminating with their lives, is evident from their admitting others into their own order; for which they had competent authority, as having been sent by Christ as he was sent by his Father. When St Paul, to magnify his office and procure to it from the Galatians due reverence, styles himself, "an apostle not of men, neither by man, but by Jesus Christ and God the Father," he must have known some who derived their apostolic mission *by man*; otherwise he could with no propriety have claimed particular respect, as he evidently does, from what was in his own apostleship no particular distinction. At that very early period, therefore, there must have been in the church *secondary* apostles, if they may be so called, upon whom, by imposition of hands, or by some other significant ceremony, the eleven had conferred that authority which was given to them by their Divine Master. Such were *Matthias* and *Barnabas*; such likewise were *Timothy*, *Titus*, and the *angels* of the seven churches in Asia, with many others whose names and offices are mentioned in the New Testament.

16
Matthias, Barnabas, Timothy, Titus, and the angels of the seven churches in Asia, bishops.

That *Matthias* and *Barnabas* were of the apostolic order, has never been controverted; and that *Timothy* and *Titus* were superior to modern presbyters, is evident from the offices assigned them. Timothy was, by St Paul, empowered to *preside* over the presbyters of Ephesus, to receive accusations against them, to *exhort*, to *charge*, and even to *rebuke* them; and Titus was, by the same apostle, left in Crete for the express purpose of setting things in order, and ordaining *presbyters* in every city. To *exhort*, to *charge*, and with authority to *rebuke* one's equal, is certainly incongruous; and therefore the Episcopalian thinks the powers conferred on Timothy altogether inconsistent with that parity of order and of office for which his antagonists so strenuously plead. Even the commission given to Titus appears in his eyes by much too extensive for a Presbyterian minister, who, after having ordained in one city, could not have proceeded to ordain in another without the consent and assistance of his brother and fellow-labourer. With respect to the *angels* of the Asiatic churches, he observes, that in the Old Testament the title of *angel* is sometimes given to the *Jewish high-priest*, and particularly by the prophet Malachi, who calls him "the messenger (*אγγελος*) of the Lord of Hosts;" and that the *angels* of the churches mention-

ed by St John, were *Christian high priests*, or *bishops* *Episcopacy*, presiding over more than one congregation, as it is affirmed by all the ancient writers, cannot, he thinks, be denied by any man who will take the trouble to compare scripture with scripture. We read (Acts xix. 10, and 20.), that "in the space of two years *all they* who dwelt in Asia heard from St Paul the word of the Lord Jesus, both Jews and Greeks; and that there the word of God *grew mightily* and *prevailed*:" but with what truth or propriety could this have been said, if at the time of St John's writing the Apocalypse, which was 30 years after St Paul's death, all the Christians of Proconsular Asia were comprised in *seven congregations*, which assembled, each with its proper pastor, to perform, in *one place*, the duties of public worship? In a word, the advocate for episcopacy insists, that no man, who reads without prejudice the acts of the apostles, the epistles of St Paul, and the Apocalypse of St John, can seriously believe that *Timothy*, *Titus*, *Epaphroditus*, *Sosthenes*, and *Silvanus*, with the *angels* of the seven churches in Asia, were *mere presbyters*, or that the government of the church was, in those days, by a college of elders.

When from the inspired penmen of the New Testament he proceeds to examine the succeeding writers of the Christian church, the Episcopalian finds such multiplied and concurring evidence of the apostolic institution of episcopacy, as he thinks it impossible to resist without denying the truth of all ancient history, and even shaking the pillars of revelation itself; for "in the noble army of martyrs," the witnesses of the episcopal government of the church are earlier, and by far more numerous, than those who testify that the *gospel* of *St Matthew* was written by that apostle, or that the book of the *Apocalypse* is canonical scripture. The authority of the *fathers* indeed is at present very low; but should they be allowed to be as fanciful divines and as bad critics as their worst enemies are pleased to represent them, this would detract nothing from their evidence when they bear witness to the constitution of the church in their own times; for of their *integrity* there can be no doubt: and what the Episcopalian wants of them is only their testimony to matters of fact which fell under the cognizance of their own senses, and about which therefore they could not be deceived. It is here indeed chiefly that he triumphs over his antagonists. In the second and third centuries there was no general council, nor any Christian sovereign. A prelacy therefore, he urges, could not have been *universally* introduced, during that period, either by a concert among the clergy, or by the authority of the civil magistrate. Yet that even *then* there was no church under heaven, of which the government was not episcopal, has been confessed by some of the most learned writers among the Presbyterians themselves; whence he concludes that episcopacy is of divine institution.

The candid Episcopalian, however, allows, that in the apostolic age there may have been some churches which at first had only bishops and deacons to perform the offices of religion; for when the number of disciples in any place was so small that they could all meet in one assembly, there was no necessity for any other order of ministers: but it appears that, from the very beginning, *bishops*, *presbyters*, and *deacons*, were settled in all

17
The divine right of episcopacy.

Episcopacy all the *larger* cities of the Roman empire; and it was in those days an allowed maxim, that without a *bishop* there could be *no church*. The better to understand the original state and institution of episcopacy, it is necessary to observe, that the empire, which contained almost all the known part of the Christian world, was by Augustus Cæsar divided into provinces, subjected each to the authority of one chief magistrate, who was commonly a *prætor* or *proconsul*, and who resided in the metropolis or chief city of the province. A province comprehended the cities of a whole region; and in the age of the apostles, each city was under the immediate government of certain magistrates within its own body, known by the name of *βουλή*, or *senatus*, *ordo* and *curia*, "the states and court of the city." Those magistrates were subordinate to the *prætor* or *proconsul*: but among them there was one superior to the rest, called sometimes *dictator*, and sometimes *defensor civitatis*, whose jurisdiction extended not only over the city itself, but likewise over all the adjacent territory. That territory was denominated *προαίτια*, or the suburbs, and often reached to the distance of 10 or 12 miles round the city, and sometimes much farther, containing within it many villages and small towns under the government of the city magistrates. From some passages in the New Testament, and from the concurring evidence of the earliest writers of the church, it appears to have been the purpose of the apostles to settle a bishop in every city where there was a civil magistracy: but as they could not be personally present in all places at once, it was natural for them to enter upon the great work of converting the nations, by first preaching the gospel in that city of each province which was the ordinary residence of the governor; because to it there must have been the greatest resort of people, who would carry the glad tidings with them into the country when they returned. Accordingly, having dispersed themselves over the empire, and made numbers of proselytes in the principal cities, they fixed in each, where they saw it necessary, a *bishop*, with a college of *presbyters* and *deacons*; and gave to those bishops, who were at first called *apostles*, a commission, as the other cities of the province should be converted, to fix in them bishops also.

18
The origin
of dioceses.

In some of the smaller cities, it is extremely probable that a bishop and a deacon were for a short time the only ecclesiastical officers, till the number of Christians increased so much as to make it impossible for them all to assemble in one house for the purposes of public worship. The bishop then ordained *presbyters* to officiate in those congregations where he himself could not be present, and to assist him in other parts of his pastoral office; but in all their ministrations the *presbyters* were subordinate to him, who was the chief pastor within the city, who composed the prayers which were offered up in public, and to whom all the other ministers of religion were accountable for their conduct. So long as the number of the faithful was confined within the walls of the city, it appears that the bishop with his *presbyters* and *deacons* lived together as in a college; that divine service was every Lord's-day, or oftener, performed in what was afterwards called the cathedral or mother-church, by the bishop himself, assisted by some of his clergy; and that the congregations which met in other churches, having no fixed

Episcopacy pastors, were supplied by such *presbyters* as the bishop chose to send to them from his own church. Whilst matters continued in this state, the clergy had no other revenues than what arose from the voluntary oblations of the people; which were indeed so large as not only to support them with decency, but likewise to answer other ends of charity and munificence. They were commonly divided into four equal parts; of which one was allotted to the bishop, a second to the inferior clergy, a third to the poor, and a fourth to keep the churches in repair; and it was considered as part of the bishop's duty to take care that the offerings should be faithfully applied to these purposes.

When converts increased in number, and churches were built in the suburbs, each of those churches had a fixed pastor similar to a parish-priest among us; but still those pastors, as well as the city-clergy, ministered in subordination to the bishop, whose authority extended as far as the civil authority of the Roman magistrate, within which district or diocese it was supreme over all orders of Christians. This every man knows who is acquainted with ecclesiastical history; for the bishop alone could ordain *priests* and *deacons*, administer the rite of *confirmation*, *absolve penitents* who were under church-censure, and *exclude from communion* heretics and notorious offenders; and from his sentence there lay no appeal but to a synod of comprovincial bishops.

Such synods were in each province convened by the bishop of the chief city; for the apostles having been careful to place in those cities men of the most eminent gifts and abilities, the other bishops of the provinces applied to them for advice upon every emergency, and paid a particular deference to them upon every occasion. So that though all bishops were of equal authority as *bishops*, yet when they met to consecrate a new bishop, or to deliberate upon the affairs of the church, they yielded a precedence to the bishop of the metropolis, who called them together, and who sat as *president* or *moderator* of the synod. Hence the origin of metropolitans or *archbishops*; whose authority was so considerable, that though there is not a doubt but the election of bishops was anciently placed in the clergy and people of the vacant diocese, yet the bishop could not be consecrated without the consent of the archbishop of the province.

In consequence of the extensive powers with which the primitive bishops were vested, they are commonly styled in the writings of those times *presidents*, *provosts*, or *inspectors* of the church, *chief priests*, *princes of the clergy*, and even *princes of the people*; but their authority was wholly spiritual. Those prelates, imitating the example of their Divine Master when on earth, neither possessed nor assumed to themselves any jurisdiction over the *properties* or *civil rights* of men. In consequence of St Paul's having reprimanded the Corinthians for going to law before the *unbelievers*, they were indeed often chosen as *arbiters* of such civil disputes as arose between individuals under their episcopal government; but on these occasions they could not act unless the submission was voluntarily made by both the contending parties, and then their decision was final. When the empire became Christian, this privilege was confirmed to them by law; for any civil cause depending before a court of justice could be withdrawn, and by the mutual consent of parties be

19
The origin
of parishes.

20
The origin
of metropolitans or
archbishops.

Episcopacy submitted to the arbitration of the bishop, whose award, which in former times could be enforced only by the terror of church-censures, was then enforced by the secular magistrate. In *criminal* causes, where the trial might be for life or death, they were prohibited both by the canons of the church and by the laws of the state from acting as judges; and therefore they never suffered such causes to come before them, except when it was necessary that the person accused, if found guilty, should be excluded from the communion of the faithful. But they had so many civil causes flowing in upon them, that they were soon obliged to devolve part of that care upon other persons in whose knowledge, prudence, and integrity, they could fully confide; and as the persons employed to act in the bishop's stead were often *laymen*, it has been conjectured that they gave rise to the office of *lay-chancellor* in the church, and to all that train of spiritual judges and spiritual courts against which such numbers are disposed to clamour.

21
The probable origin of spiritual courts.

22
Bishops had no civil rank till after the subversion of the Roman empire and the conversion of the Gothic nations.

Be this as it may, it is certain that, through the piety and munificence of the Christian emperors, the bishops enjoyed large revenues and many valuable privileges; but it does not appear that they had any rank or authority, as *barons* or *temporal princes*, till the Gothic nations, which subverted the Roman empire, had embraced the Christian faith. As Christianity incapacitated the leaders of those tribes from officiating as chief priests at the religious rites which were usually celebrated at the opening of their public assemblies, the bishops came naturally to discharge that duty on such occasions, when they must have shared in the rank by sharing in the functions of the chief. The situation in which they thus appeared at the opening of all political conventions, would enable them to join with much effect in the deliberations which ensued; and their superior knowledge, their sacred character, and their influence with the people, would soon acquire them power equal to their rank. They must therefore have been well intitled to demand admission into that council which was formed by the king and the lay-chiefs at the national assemblies: and as they balanced the authority of those chiefs, we cannot doubt that the king would be disposed to give the utmost effect to their claim. Accordingly, we find the dignified clergy, who received large grants of land to be held on the same tenures with the lands of the lay magistrates, presiding along with those magistrates in the provincial assemblies of every degree in all the Gothic nations, and enjoying every advantage in point of rank and authority in their national diets. Hence the bishop of Rome, and several bishops in Germany, have, like the dukes and marquises of that empire, been for a long time sovereign princes; and hence too the bishops of England and Ireland have always sat, and have an equal right with the lay-peers to sit, in the upper house of parliament. It is however obvious, that, so far as episcopacy is of *apostolical* institution, those peers and princes possess not the *original* character in any higher degree than the bishops in America, who are barely tolerated, or than those in Scotland who do not enjoy that privilege; and that confirmation administered, or holy orders conferred, by a persecuted prelate, must be as effectual to the purposes of religion, as if given by a German prince or an English peer.

In this short view of episcopacy, it has been our endeavour to do justice to the subject, without suffering ourselves to be influenced by partiality or prejudice. As we are not ourselves episcopalians, we have advanced nothing of our own; but have selected from English writers, who have at different times undertaken to defend the *divine right* of episcopacy, such facts and arguments as to us appear to be of the most importance, or to have the greatest weight, without remarking upon them, or offering any answer. The reasoning employed to prove that the order of bishops was instituted by the apostles, is taken from a work prepared for the press by Dr Berkeley prebendary of Canterbury, and son of the celebrated bishop of Cloyne. For the rest of the detail, we are indebted chiefly to Bingham's *Origines Ecclesiasticae*; a performance in great estimation with those English divines who are commonly known by the appellation of *high churchmen*. As editors of a work of this kind, it is not *our* business to be of any party, or to support, in opposition to all others, a particular church, though that church should be our own: We shall therefore treat *independency* and *presbytery* as we have treated *episcopacy*, by employing some able writer of each society to plead his own cause. Mean while, we shall conclude this article with a few reflections, which, though they come from the pen of an obscure author, deserve to be engraved deep in the memory of every controvertist of every communion.

“On complicated questions (says a late apologist for the episcopal church in Scotland), men will always differ in opinion; but conscious each of the weakness of his own understanding, and sensible of the bias which the strongest minds are apt to receive from thinking long in the same track, they ought to differ with charity and meekness. Since unhappily there are still so many subjects of debate among those who name the name of Christ; it is doubtless every man's duty, after divesting himself as much as possible of prejudice, to investigate those subjects with accuracy, and to adhere to that side of each disputed question which, after such investigation, appears to him to be the truth: but he transgresses the favourite precept of his divine Master, when he casts injurious reflections, or denounces anathemas, upon those who, with equal sincerity, may view the matter in a different light; and by his want of charity does more harm to the religion of the *Prince of Peace*, than he could possibly do good, were he able to convert all mankind to his own orthodox opinions.”

23
Moderation in controversy recommended.

EPISCOPAL, something belonging to BISHOPS.

EPISCOPALIANS, in church-history, an appellation given to those who prefer the episcopal government and discipline to all others. See EPISCOPACY.

By the test act, none but Episcopalian, or members of the church of England, are qualified to enjoy any office civil or military.

EPISCOPIUS (Simon), one of the most learned men of the 17th century, and the chief supporter of the Arminian sect, was born at Amsterdam in 1583. In 1612, he was chosen divinity professor at Leyden, in the room of Gomarus, who resigned; and the functions of his office, with his private studies, were light burdens to him, compared with the difficulties he sustained on account of the Arminian controversy: which, though it began in the universities, soon flew to the pulpits,

Episcopus
||
Epistle.

pulpits, from whence it spread and inflamed the people. The states of Holland having invited Episcopus to take his place at the synod of Dort, he went thither accompanied by some remonstrant ministers; but the synod would not allow them to sit as judges, nor to appear in any other capacity than as persons summoned before them: they submitted, were deposed from their functions, and banished the territories of the commonwealth. Episcopus and his persecuted brethren retired to Antwerp; but the times growing more favourable, he returned to Holland in 1626, and was made minister of the church of the Remonstrants at Rotterdam: in 1634, he was chosen rector of the college founded by his sect at Amsterdam, where he spent the remainder of his days. He died in 1643, of the same disorder which had killed his wife before, a retention of urine; having lost his sight some weeks previous to his end. The learned have bestowed great eulogiums on Episcopus; but he did not always write with that moderation which might have been wished. His works make two volumes in folio, of which the second consists of posthumous publications.

EPISCOPUS, the same with bishop. See BISHOP and EPISCOPACY.

EPISODE, in poetry, a separate incident, story, or action, which a poet invents, and connects with his principal action, that his work may abound with a greater diversity of events; though, in a more limited sense, all the particular incidents whereof the action or narration is compounded, are called *episodes*. See POETRY.

EPISPASTIC, in medicine, a topical remedy, which being applied to the external parts of the body, attracts the humours to that part.

EPISTATES, in the Athenian government, was the president of the *proedri*. See PROEDRI.

EPISTEMONARCH, in the ancient Greek church, an officer of great dignity, who had the care of every thing relating to faith, in the quality of censor. His office answered pretty nearly to that of master of the sacred palace at Rome.

EPISTLE, denotes the same with a missive letter; but is now chiefly used in speaking of ancient writings, as the epistles of St Paul, epistles of Cicero, epistles of Pliny, &c.

EPISTLES and Gospels, in the liturgy of the church of England, are select portions of scripture, taken out of the writings of the evangelists and apostles, and appointed to be read, in the communion-service, on Sundays and holidays. They are thought to have been selected by St Jerom, and by him put into the lectionary. It is certain, they were very anciently appropriated to the days whereon we now read them, since they are not only of general use throughout the western church, but are also commented upon in the homilies of several ancient fathers, which are said to have been preached upon those very days to which these portions of scripture are now affixed.

The epistles and gospels are placed in an admirable order and method, and bear a special relation to the several days whereon they are read. The year is distinguished into two parts; the first being designed to commemorate Christ's living among us, the other to instruct us to live after his example. The former takes in the whole time from Advent to Trinity-Sunday; the

latter, all the Sundays from Trinity to Advent. During the first of these seasons, the epistles and gospels are calculated to raise in us a grateful sense of what our Saviour did and suffered for us, and set before our eyes his nativity, circumcision, and manifestation to the Gentiles; his doctrines and miracles; his baptism, fasting, and temptation; his agony and bloody sweat; his cross and passion; his death, burial, resurrection, and ascension; and his mission of the Holy Ghost. During the second season of the year, the epistles and gospels tend to instruct us in the true paths of Christianity. See COLLECTS.

EPISTOLARY, something belonging to an epistle. See EPISTLE.

EPISTOLARY Composition. See LETTER; and the article POETRY.

EPISTROPHE. See ORATORY, n° 71.

EPISTYLE, in the ancient architecture, a term used by the Greeks for what we call *architrave*, viz. a massive piece of stone or wood, laid immediately over the capital of a column.

EPITAPH (from *ἐπὶ* upon, and *τάφος* sepulchre), a monumental inscription, in honour or memory of a person deceased. It has been disputed whether the ancient Jews inscribed epitaphs on the monuments of the dead; but be this as it will, epitaphs it is certain, of very ancient date, are found amongst them.—The Athenians, by way of epitaph, put only the name of the dead, with the epithet *καλός*, signifying "good," or *ἥρως* "hero," and the word *χαίρει*, signifying their good wishes: The name of the deceased's father and his tribe were frequently added.—The Lacedemonians allowed epitaphs to none but those who had died in battle. The Romans inscribed their epitaphs to the *manes*, *dis manibus*; and frequently introduced the dead by way of *protopoeia*, speaking to the living; of which we have a fine instance, worthy the Augustan age, wherein the dead wife thus bespeaks her surviving husband:

*Immatura perī; sed tu, felicior, annos
Vive tuos, conjux optime, vive meos.*

The epitaphs of the present day are generally crammed with fulsome compliments which were never merited, characters which human nature in its best state could scarce lay claim to, and expressions of respect which were never paid in the life-time of the deceased. Hence the proverb with great propriety took its rise, "He lies like an epitaph."

EPITAPH, is also applied to certain eulogies, either in prose or in verse, composed without any intent to be engraven on tombs; as, That of Alexander,

Sufficit huic tumulus, cui non sufficeret orbis;

and that of Newton,

*Isaacum Newton,
Quem immortalem
Testantur Tempus, Natura, Caelum,
Mortalem hoc marmor
Fatetur.*

EPITASIS, in ancient poetry, the second part or division of a dramatic poem, wherein the plot, entered upon in the first part or *protasis*, was carried on, heightened, and worked up, till it arrived at its state or height, called *catastasis*.

EPITASIS, in medicine, the increase of a disease or beginning of a paroxysm, particularly in a fever.

EPITHALAMIUM, in poetry, a nuptial song or composition

Epistolary
||
Epithalamium.

Epithem
||
Epode.

composition in praise of the bride and bridegroom, praying for their prosperity, for a happy offspring, &c.

Epithalamia were sung amongst the Jews, at the door of the bride, by her friends and companions, the evening before the marriage. Psalm xlv. is an epithalamium. Among the Greeks the epithalamium was sung as soon as the married couple were gone to bed, and attended with shouts and stamping of the feet to drown the cries of the bride. They returned in the morning, and with the same song, a little altered, saluted them again. The evening song was called *πιδάλαμια κοιμητικά*, the morning salute was called *πιδάλαμια εγερτικά*. This was the practice amongst the Romans also, but their epithalamia were often obscene.

EPITHEM, in pharmacy, a kind of fomentation, or remedy of a spirituous or aromatic kind, applied externally to the regions of the heart, liver, &c. to strengthen and comfort the same, or to correct some intemperature thereof.

EPITHET, in poetry and rhetoric, an adjective expressing some quality of a substantive to which it is joined; or such an adjective as is annexed to substantives by way of ornament and illustration, not to make up an essential part of the description. Nothing, says Aristotle, tires the reader more than too great a redundancy of epithets, or epithets placed improperly; and yet nothing is so essential in poetry as a proper use of them. The writings of the best poets are full of them.

EPITOME, in literary history, the same with ABRIDGEMENT.

EPITRITUS, in prosody, a foot consisting of three long syllables and one short. Of these, grammarians reckon four kinds: the first consisting of an iambus and spondee, as *fālūtāntēs*; the second, of a trocheus and spondee, as *cōncitātī*; the third, of a spondee and an iambus, as *cōmmūnicāns*; and the fourth, of a spondee and trocheus, as *īncāntārē*. See the articles SPONDEUS, TROCHEUS, &c.

EPITROPE. See ORATORY, n° 83.

EPITROPUS, a kind of judge, or rather an arbitrator, which the Greek Christians under the dominion of the Turks elect in the several cities, to terminate the differences that arise among them, and avoid carrying them before the Turkish magistrates. See ARBITRATOR.

Anciently the Greeks used the term *ἐπιτροπος* in the same sense as the Latins did *procurator*, viz. for a commissioner or intendant. Thus the commissioners of provisions in the Persian army are called by Herodotus and Xenophon *epitropi*. In the New Testament, *ἐπιτροπος* denotes the steward of a household, rendered in the vulgate *procurator*.

EPIZEUXIS. See ORATORY, n° 68.

EPOCHA, in chronology, a term or fixed point of time whence the succeeding years are numbered or counted. See ÆRA.

EPODE, in lyric poetry, the third or last part of the ode, the ancient ode being divided into strophe, antistrophe, and epode. See ODE, &c.

The epode was sung by the priests, standing still before the altar, after all the turns and returns of the strophe and antistrophe, and was not confined to any precise number or kind of verses.

The epode is now a general name for all kinds of little verses that follow one or more great ones, of what

kind soever they be: and in this sense, a pentameter is an epode after an hexameter. And as every little verse, which, being put after another, closes the period, is called *epode*; hence the sixth book of Horace's odes is intitled *liber epodon*, "book of epodes," because the verses are all alternately long and short, and the short ones generally, though not always, close the sense of the long one.

EPOPOEIA, in poetry, the history, action, or fable, which makes the subject of an epic poem. The word is derived from the Greek *ἐπος* *carmen*, "verse;" and *ποιω* *facio*, "I make."

In the common use of the word, however, *epopœia* is the same with *epos*, or epic poem itself. See the article POETRY.

EPOPS, or HOOPOE. See UPUPA.

EPSOM, a town of Surry, about 16 miles south-west from London, long famous for its mineral waters. These were discovered in 1618; and though not in such repute as formerly, yet they are not impaired in virtue, and the salt * made from them is * See Chemistry. Indolent famous all over Europe, for gently cleansing and cooling the body. The hall, galleries, and other public apartments, are now run to decay; and there remains only one house on the spot, which is inhabited by a countryman and his wife, who carry the waters in bottles to the adjacent places, and supply the demands of dealers in London. On the neighbouring downs are annually horse-races; but the inns, shops, and bowling-greens are not near so much frequented as formerly. The market is on Friday; fair, July 25. The town is about one mile and an half in semicircle, from the church to the palace at Durdans, which was burnt down some years since, but has been rebuilt. It was once inhabited by his present majesty's father. In Hudson's-Lane here was Epsom-Court, an ancient Saxon seat, long since converted into a farm. Here are so many fields, meadows, orchards, gardens, and the like, that a stranger would be at a loss to know whether this was a town built in a wood, or a wood surrounded by a town.

Epsom water is easily imitated by art; i. e. by only dissolving half an ounce of Epsom salt in a quart of pure water, made somewhat brisk or quick by a few drops of spirit of vitriol and oil of tartar, so as to let the alkali prevail.

EPULARES, in antiquity, an epithet given to those who were admitted to the sacred *epula* or entertainments, it being unlawful for any to be present at them who were not pure and chaste.

EPULO, in antiquity, the name of a minister of sacrifice among the Romans.

The pontifices, not being able to attend all the sacrifices performed at Rome to so many gods as were adored by that people, appointed three ministers, whom they called *epulones*, because they conferred on them the care and management of the *epula*, feasts in the solemn games and festivals. To them belonged the ordering and serving the sacred banquet, offered on such occasions to Jupiter, &c. They wore a gown bordered with purple like the pontifices. Their number was at length augmented from three to seven, and afterwards by Cæsar to ten. Their first establishment was in the year of Rome 558, under the consulate of L. Furius Purpureo, and M. Claudius Marcellus.

EPULUM,

Epopœia
||
Epulo.

Epulum
||
Equery.

EPULUM, in antiquity, a holy feast prepared for the gods in times of public danger. The feast was sumptuous, and the gods were formally invited and attended; for the statues were brought on rich beds furnished with soft pillows, called *pulvinaria*: Thus accommodated, their godships were placed on their couches at the most honourable part of the table. The care of the *epula* belonged to the *epulones*, and the gods were plentifully served with the richest dainties, as if they were able to eat; but the *epulones* performed that function for them, and doubtless were competent proxies! No wonder that Pliny solicited Trajan to be admitted of their order.

EPULUM is also used to signify any solemn feast; so we meet with *epulum ferale*, "a funeral entertainment."

EQUABLE, an appellation given to such motions as always continue the same in degree of velocity, without being either accelerated or retarded.

EQUAL, a term of relation between two or more things of the same magnitude, quantity, or quality.

Mathematicians speak of *equal* lines, angles, figures, circles, ratios, solids.

EQUALITY, that agreement between two or more things, whereby they are denominated equal.

EQUANIMITY, in ethics, denotes that even and calm frame of mind and temper, under good or bad fortune, whereby a man appears to be neither puffed up nor overjoyed with prosperity, nor dispirited, soured, or rendered uneasy by adversity.

EQUATIONS, in algebra. See **ALGEBRA**, chap. iii.

EQUATION of Time, in astronomy and chronology, the reduction of the apparent time or motion of the sun, to equable, mean, or true time. See **ASTRONOMY**, n° 383.

EQUATOR, or **ÆQUATOR**, in astronomy and geography, a great circle of the sphere, equally distant from the two poles of the world, or having the same poles with those of the world. It is called the *equator*, because when the sun is in it the days and nights are *equal*; whence also it is called the *equinoctial*; and when drawn on maps and planispheres, the *equinoctial line*, or simply the *line*. Every point of the equator is a quadrant's distance from the poles of the world; whence it follows, that the equator divides the sphere into two hemispheres, in one of which is the northern, and in the other the southern pole.

EQUATORIAL INSTRUMENT. See **ASTRONOMY**, n° 499, 504.

EQUERY, or **ECURY**, a grand stable or lodge for horses, furnished with all the conveniences thereof; as stalls, manger, rack, &c. The word is formed from the French *escurie*, which signifies the same thing. Some again derive *escurie* from the Latin *scuria*, which not only denotes a place for beasts to be put up in, but also a grange or barn. But a more probable derivation is from *equile* "a stable for horses," of *equus* "horse." Some hold that the word *stable*, in propriety, relates only to bullocks, cows, sheep, hogs, &c. and *equery*, to horses, mules, &c.

A *simple equery* is that provided for one row of horses; a *double equery* that provided for two, with a passage in the middle, or two passages; the horses being placed head to head, as in the little equery at Versailles.

Under equery are sometimes also comprehended the lodgings and apartments of the equeries, grooms, pages, &c.

EQUERY (*escuyer*), is also an officer who has the care and management of the horses of a king or prince.

EQUERIES, or **EQUERRIES**, popularly called *Querries*, are particularly used among us for officers of the king's stables, under the master of the horse, seven in number, who, when his majesty goes abroad, ride in the leading coach, are in waiting one at a time monthly, and have a table with the gentlemen-ushers during the time, and a salary of L. 300 a-year each. They used to ride on horseback by the coach-side when the king travelled; but that being more expensive to them than necessary to the sovereign, it has been discontinued.

EQUERIES of the Crown Stable have that appellation, as being employed in managing and breaking the saddle-horses, and preparing them for the king's riding. These are two in number; the first having an annual salary of L. 256, and the second L. 200, whereof one is, or always should be, in close waiting at court; and when his majesty rides, holds the stirrup, while the master of the horse, or one of the equeries in his absence, assists in mounting him; and when his majesty rides, they usually attend him.

EQUES, in antiquity. See **EQUESTRIAN Order**, and **EQUITES**.

EQUES Auratus, is used to signify a knight-bachelor, called *auratus*, q. d. *gilt*, because anciently none but knights might gild or beautify their armour or other habiliments of war with gold. In law this term is not used, but instead of it *miles*, and sometimes *chevalier*.

EQUESTRIA, among the Romans, a place in the theatre where the equites or knights sat.

EQUESTRIAN (*Equestris*), a term chiefly used in the phrase *equestrian statue*, which signifies a statue representing a person mounted on horseback. The word is formed of the Latin *eques*, "knight, horseman," of *equus*, "horse."

EQUESTRIAN Games, among the Romans, horse-races, of which there were five kinds, the *prodromus* or *plain horse-race*, the *chariot-race*, the *decursory-race* about funeral piles, the *ludi sevirales*, and the *ludi neptunales*.

EQUESTRIAN Order, among the Romans, signified their knights or equites; as also their troopers or horsemen in the field; the first of which orders stood in contradistinction to the senators; as the last did to the foot, military, or infantry. Each of these distinctions was introduced into the state by Romulus.

EQUIANGULAR, in geometry, an epithet given to figures whose angles are all equal: such are a square, an equilateral triangle, &c.

EQUIDISTANT, an appellation given to things placed at equal distances from some fixed point or place to which they are referred.

EQUILATERAL, in general, something that hath equal sides; as an equilateral triangle.

EQUILIBRIUM, in mechanics, is when the two ends of a lever or balance hang so exactly even and level, that neither doth ascend or descend, but both keep in a position parallel to the horizon; which is occasioned by their being both charged with an equal weight.

EQUIMULTIPLES,

Equeries
||
Equilibrium.

Equimulti-
ples
||
Equip.

EQUIMULTIPLES, in arithmetic and geometry, are numbers or quantities multiplied by one and the same number or quantity. Hence, equimultiples are always in the same ratio to each other as the simple quantities before multiplication: thus, if 6 and 8 are multiplied by 4, the equimultiples 24 and 32 will be to each other as 6 to 8.

EQUINOCTIAL, or **ÆQUINOCTIAL**, in astronomy, a great and immoveable circle of the sphere, under which the equator moves in its diurnal motion.

The equinoctial or equinoctial line, is ordinarily confounded with the equator: but there is a difference; the equator being moveable, and the equinoctial immoveable; and the equator being drawn about the convex surface of the sphere, but the equinoctial on the concave surface of the magnus orbis.

Whenever the sun in his progress through the ecliptic comes to this circle, it makes equal days and nights all around the globe; as then rising due east and setting due west, which he never does at any other time of the year. And hence the denomination from *æquus* and *nox*, "night," *quia æquat diem nocti*.

The equinoctial then is the circle which the sun describes, or appears to describe, at the time of the equinoxes; that is, when the length of the day is every where equal to that of night, which happens twice a year. See **EQUINOX**.

EQUINOCTIAL, in geography. See **EQUATOR**.

The shadows of those who live under this circle are cast to the southward of them for one half of the year, and to the northward of them during the other half; and twice in a year, *viz.* at the equinoxes, the sun at noon casts no shadow, being in their zenith.

From this circle is the declination or latitude of places accounted in the degrees of the meridian.

EQUINOCTIAL Points, are the two points wherein the equator and ecliptic intersect each other: the one being in the first point of Aries, is called the *vernal point* or *equinox*; and the other in the first point of Libra, the *autumnal point* or *equinox*.

EQUINOCTIAL Dial, is that whose plane lies parallel to the equinoctial. See **DIAL**.

EQUINOX, or **ÆQUINOX**, in astronomy, the time when the sun enters one of the equinoctial points.

The equinoxes happen when the sun is in the equinoctial circle; when of consequence the days are equal to the nights throughout the world, which is the case twice a year, *viz.* about the 20th of March and the 23d of September, the first of which is the vernal and the second the autumnal equinox.

It is found by observation, that the equinoctial points, and all the other points of the ecliptic, are continually moving backward, or in *antecedentia*, that is, westward. This retrograde motion of the equinoctial points, is that famous and difficult phenomenon called the *precession of the equinoxes*. See **ASTRONOMY**, n^o 348, 349.

EQUIPAGE, in the military art, denotes all sorts of utensils, artillery, &c. necessary for commencing and prosecuting with ease and success any military operations. Camp and field equipage consists of tents, kitchen-furniture, saddle-horses, baggage, waggons, bat-horses, &c.

To **EQUIP**, in naval language, a term borrowed from the French marine, and frequently applied to the N^o 418.

business of fitting a ship for sea, or arming her for war.

EQUIPOLLENCE, in logic, is when there is an equivalence between any two or more terms or propositions; *i. e.* when they signify one and the same thing, though they express it differently. Such propositions, &c. are said to be *equipollent*.

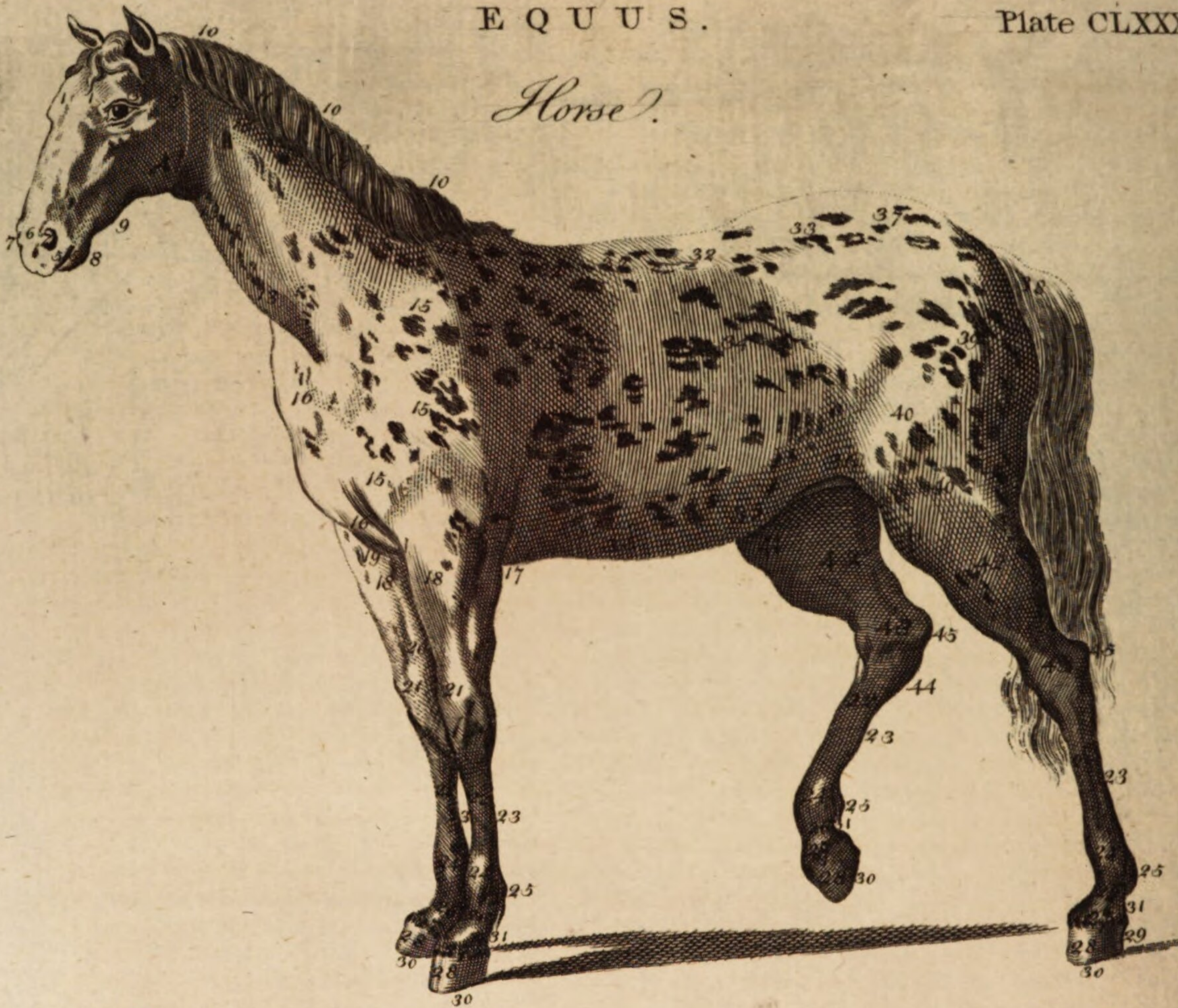
EQUIRIA, in antiquity, a festival instituted by Romulus, and celebrated on the 27th of February, in honour of Mars, at which there were horse-races.

EQUISETUM, **HORSE-TAIL**: A genus of the order of filices, belonging to the cryptogamia class of plants; and in the natural method ranking under the 51st order, *Coniferae*. There is a spike of peltated or shielded fructifications opening at the base. There are seven species; of which the most remarkable are, 1. The *sylvaticum*, or wood horse-tail. It grows in woods and moist shady places in many parts of England and Scotland. The stalk rises from 12 to 18 inches high, angular, and rough to the touch; the angles being edged with sharp *spiculae*, scarce visible without a microscope. The leaves grow verticillate, 12 or more in a whorl, and these whorls are about an inch distant from one another. The leaves are very slender, nearly quadrangular, about five inches long, pendent, and beset with several other secondary whorls, so that it resembles a pine-tree in miniature. Horses are very fond of this plant, and in some parts of Sweden it is collected to serve them as winter food. 2. The *arvense*, common or corn horse-tail, grows in wet meadows and corn-fields. The most remarkable property of this is, that its seeds, when viewed by a microscope, are seen to leap about as if they were animated. It has a very astringent and diuretic quality, and has been esteemed serviceable in the *hematuria* and *gonorrhoea*, but is disregarded by the present practice. It is a troublesome plant in pastures; and disagreeable to cows, being never touched by them unless they are compelled by hunger, and then it brings on an incurable diarrhoea. It does not seem to affect horses or sheep. 3. The *palustre*, marsh horse-tail, or paddock pipe, is frequent in marshes and ditches. It is not so rough as the former, but is likewise prejudicial to cattle. 4. The *fluviale*, or great river horse-tail, is frequent in shady marshes, and on the brinks of stagnant waters. It is the largest of all the species, growing sometimes to the height of a yard, and near an inch in diameter. Haller tells us, that this kind of equisetum was eaten by the Romans; and Linnæus affirms, that oxen and rein-deer are fond of it, but that horses refuse it. 5. The *hyemale*, rough horse-tail, shave-grass, or Dutch rushes. This is much used by the whitesmiths and cabinet-makers, under the name of *Dutch rushes*, for polishing their metals and wood. All the other species will answer this purpose in some degree, but the last better than any of the rest. In Northumberland the dairy-maids scour and clean their milk-pails with it. Some imagine, that if cows are fed with this species, their teeth will fall out.

EQUITES, amongst the Romans, were persons of the second degree of nobility, immediately succeeding the senators in point of rank. The *equites* or knights were required to be possessed of 400 *sestertia* before they could be admitted into that order; and when the knights were so reduced as to fall short of the prescribed

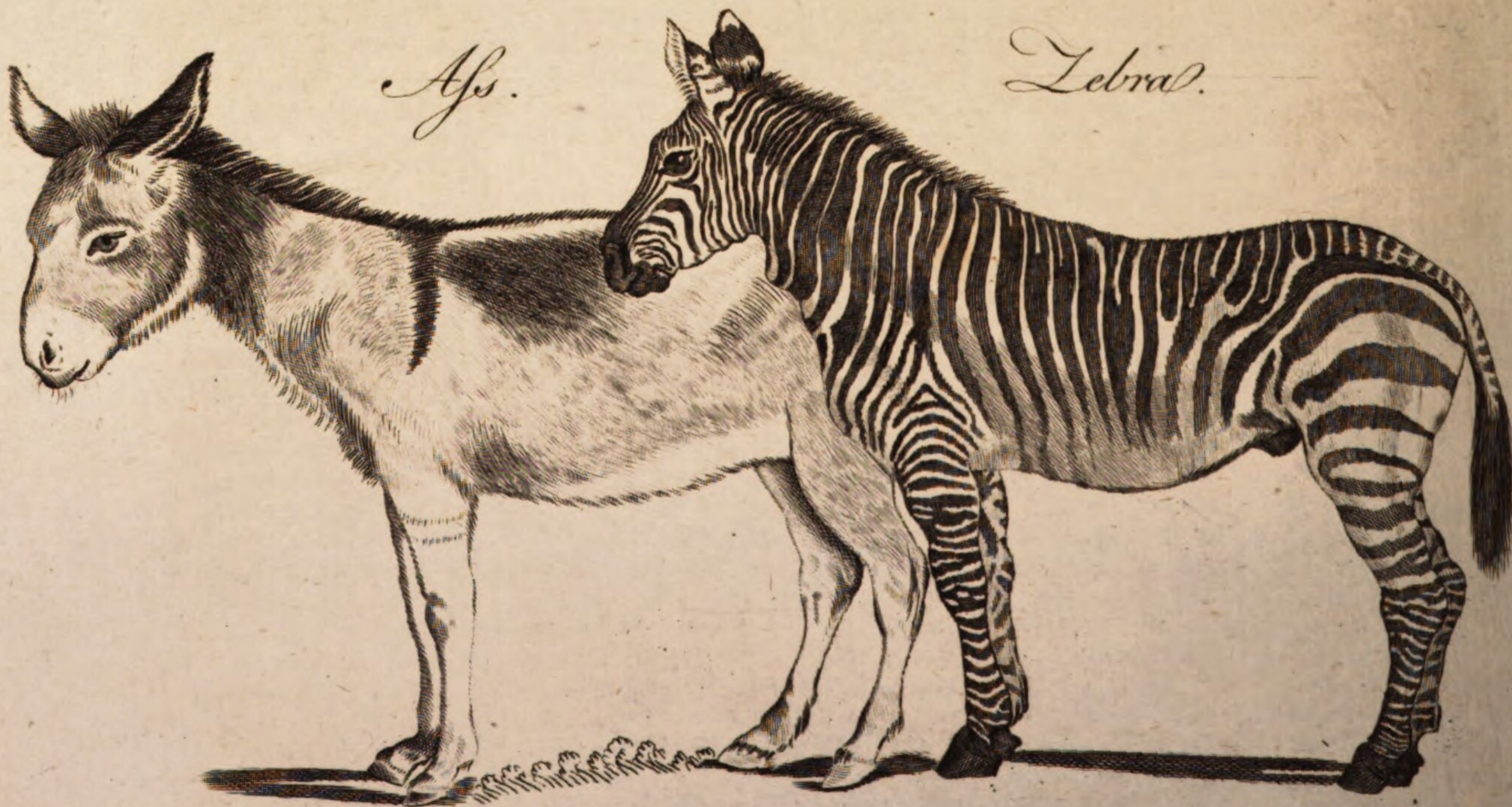
Equipol-
lence
||
Equites.

Horse?



As.

Zebra.



A. Bell Pin. Nat. Sculptor fecit.

Equity, scribed revenue, they were expunged out of the equestrian list. The equestrian revenue just mentioned amounted to about 10,000 crowns.

Part of the ceremony whereby the honour of knight-hood was conferred amongst the Romans was the giving of a horse; for every *equus* or knight had a horse kept at the public charge, he received also the stipend of an horseman to serve in the wars, and wore a ring which was given him by the state. The *equites* composed a large body of men, and constituted the Roman cavalry; for there was always a sufficient number of them in the city, and nothing but a review was requisite to fit them for service.

The knights at last grew too powerful, were a balance for the senate and people, neglected the exercises of war, and betook themselves to civil employments. The *equites* were liable to be punished by the censors, and to suffer degradation. They were degraded by taking from them the horse which was kept for each of them at the public charge; this was called *equum adimere*.

EQUITY, in a general sense, the virtue of treating all other men according to reason and justice, or as we would gladly be treated ourselves when we understand aright what is our due. See **JUSTICE**.

EQUITY, in jurisprudence, is defined a correction or qualification of the law, generally made in that part wherein it faileth or is too severe. It likewise signifies the extension of the words of the law to cases unexpressed, yet having the same reason; so that where one thing is enacted by statute, all other things are enacted that are of the like degree. For example, the statute of *Glouc.* gives action of waste against him that holds lands for life or years; and by the equity thereof, a man shall have action of waste against a tenant that holds but for one year, or one half-year, which is without the words of the act, but within the meaning of it; and the words that enact the one, by equity enact the other. So that equity is of two kinds. The one abridges and takes from the letter of the law: the other enlarges and adds to it; and statutes may be construed according to equity, especially where they give remedy for wrong, or are for expedition of justice. Equity seems to be the interposing *law of reason*, exercised by the lord chancellor in extraordinary matters to do equal justice; and by supplying the defects of the law, gives remedy in all cases. See **CHANCERY**.

EQUITY, in mythology, sometimes confounded with *Justice*, a goddess among the Greeks and Romans, represented with a sword in one hand and a balance in the other.

EQUIVALENT, is understood of something that is equal in value, force, or effect, to another.

Equivalence is of various kinds, in propositions, in terms, and in things.

EQUIVALENT Propositions. See **EQUIPOLLENCE**.

EQUIVALENT Terms are where several words that differ in sound have yet one and the same signification; as *every body was there*, and *nobody was absent*, *nihil non*, and *omne*.

EQUIVALENT Things, are either *moral*, *physical*, or *statistical*. *Moral*, as when we say that the commanding or advising a murder is a guilt equivalent to that of the murderer. *Physical*, as when a man who has the strength

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of two men is said to be equivalent to two men. *Statistical*, whereby a less weight becomes of equal force with a greater, by having its distance from the centre increased.

EQUIVOCAL TERMS or words, among logicians, are those which have a doubtful or double meaning.

According to Mr Locke, the doubtfulness and uncertainty of words has its cause more in the ideas themselves, than in any incapacity of the words to signify them; and might be avoided, would people always use the same term to denote the same idea or collection of ideas: but, adds he, it is hard to find a discourse on any subject where this is the case; a practice which can only be imputed to folly or great dishonesty; since a man, in making up his accounts, might with as much fairness use the numeral characters sometimes for one sometimes for another collection of units.

EQUIVOCAL Generation, the production of animals without the intercourse between the sexes, by the influence of the sun or stars, &c.

This kind of generation is now quite exploded by the learned.

EQUIVOCATION, the using a term or expression that has a double signification. Equivocations are expedients to save telling the truth, and yet without telling a falsity. The fathers are great patrons of equivocations and mental reservations, holding that the use of such shifts and ambiguities is in many cases allowable.

EQUULEUS, or **ECCULEUS**, in antiquity, a kind of rack used for extorting a confession, at first chiefly practised on slaves, but afterwards made use of against the Christians.

The equuleus was made of wood, having holes at certain distances, with a screw, by which the criminal was stretched to the third, sometimes to the fourth, or fifth holes, his arms and legs being fastened on the equuleus with cords; and thus was hoisted aloft, and extended in such a manner, that all his bones were dislocated. In this state red-hot plates were applied to his body, and he was goaded in the sides with an instrument called *ungula*.

EQUULEUS, **EQUICULUS**, and *Equus Minor*, the horse's head, in astronomy, a constellation of the northern hemisphere, whose stars in Ptolemy's catalogue are 4, in Tycho's 4, in Hevelius's 6, and in Mr Flamsteed's 10.

EQUUS, in zoology, a genus of quadrupeds belonging to the order of belluæ. This genus comprehends the horse, the mule, the ass, the zebra, and the quagga: they have six erect and parallel fore-teeth in the upper jaw, and six somewhat prominent ones in the under jaw; the dog-teeth are solitary, and at a considerable distance from the rest; and the feet consist of an undivided hoof.

1. The *caballus*, or **HORSE**, has a long flowing mane, and the tail covered on all parts with long hairs.

The horse, in a domestic state, is a bold and fiery animal; equally intrepid as his master, he faces danger and death with ardour and magnanimity. He delights in the noise and tumult of arms, and seems to feel the glory of victory: he exults in the chase; his eyes sparkle with emulation in the course. But though bold and intrepid, he is docile and tractable: he knows how to

4 U

govern

Sta- Equivocal
||
Equus.

Plate
CLXXXIII.

Buffon Histoire Naturelle.

Equus.

govern and check the natural vivacity and fire of his temper. He not only yields to the hand, but seems to consult the inclination of his rider. Constantly obedient to the impressions he receives, his motions are entirely regulated by the will of his master. He in some measure resigns his very existence to the pleasure of man. He delivers up his whole powers; he reserves nothing; he will rather die than disobey. Who could endure to see a character so noble abused! who could be guilty of such gross barbarity!

This character, though natural to the animal, is in some measure the effect of education. His education commences with the loss of liberty, and is finished by constraint. The slavery of the horse is so ancient and so universal, that he is but rarely seen in a natural state. Several ancient writers talk of wild horses, and even mention the places where they were to be found. Herodotus takes notice of white savage horses in Scythia; Aristotle says they are to be found in Syria; Pliny, in the northern regions; and Strabo, in Spain and the Alps. Among the moderns, Cardan says, that wild horses are to be found in the Highlands of Scotland and the Orkney isles; Olaus, in Muscovy; Dapper, in the island of Cyprus; Leo and Marmol, in Arabia and Africa, &c. But as Europe is almost equally inhabited, wild horses are not to be met with in any part of it: and those of America were originally transported from Europe by the Spaniards; for this species of animals did not exist in the new world. The Spaniards carried over a great number of horses, left them in different islands, &c. with a view to propagate that useful animal in their colonies. These have multiplied incredibly in the vast deserts of those thinly peopled countries, where they roam at large without any restraint. M. de Salle relates, that he saw, in the year 1685, horses feeding in the meadows of North America, near the bay of St Louis, which were so ferocious that nobody durst come near them. Oexmelin says, that he has seen large troops of them in St Domingo running in the valleys: that when any person approached, they all stopped; and one of them would advance till within a certain distance, then snort with his nose, take to his heels, and the whole troop after him. Every author who takes notice of these horses of America, agree that they are smaller and less handsome than those of Europe. These relations sufficiently prove, that the horse, when at full liberty, though not a fierce or dangerous animal, has no inclination to associate with mankind; that all the softness and ductility of his temper proceeds entirely from the culture and polish he receives in his domestic education, which in some measure commences as soon as he is brought forth.

The motions of the horse are chiefly regulated by the bit and the spur; the bit informs him how to direct his course, and the spur quickens his pace. The mouth of the horse is endowed with an amazing sensibility: the slightest motion or pressure of the bit gives him warning, and instantly determines his course.

The horse has not only a grandeur in his general appearance, but there is the greatest symmetry and proportion in the different parts of his body. The regularity and proportion of the different parts of the head gives him an air of lightness, which is well supported by the strength and beauty of his chest. He erects his head, as if willing to exalt himself above the condition

of other quadrupeds: his eyes are open and lively; his ears are handsome, and of a proper height; his mane adorns his neck, and gives him the appearance of strength and boldness.

At the age of two years, or two years and a half, the horse is in a condition to propagate; and the mare, like most other females, is ready to receive him still sooner. But the foals produced by such early embraces are generally ill-made and weakly. The horse should never be admitted to the mare till he is four or four and a half; this is only meant with regard to draught-horses. Fine horses should not be admitted to the mare before they be six years old; and Spanish stallions not till seven. The mares are generally in season from the beginning of April to the end of June; but their chief ardour for the horse lasts but about 15 or 20 days, and this critical season should always be embraced. The stallion ought to be sound, well made, vigorous, and of a good breed. For fine saddle-horses, foreign stallions, as Arabians, Turks, Barbs, and Andalusians, are preferable to all others. Next to these, British stallions are the best; because they originally sprang from those above-mentioned, and are very little degenerated. The stallions of Italy, and especially the Neapolitans, are very good. The best stallions for draught or carriage horses, are those of Naples, Denmark, Holstein, and Freezeland. The stallions for saddle-horses should be from 14 to 15 hands high, and for draught horses at least 15 hands. Neither ought the colour of stallions to be overlooked; as a fine black, grey, bay, sorrel, &c. Besides these external qualities, a stallion ought to have courage, tractability, spirit, agility, a sensible mouth, sure limbs, &c. These precautions in the choice of a stallion are the more necessary, because he has been found by experience to communicate to his offspring almost all his good or bad qualities, whether natural or acquired.

The mare contributes less to the beauty of her offspring than the stallion; but she contributes perhaps more to their constitution and stature: for these reasons, it is necessary that the mares for breed be perfectly sound, and make good nurses. For elegant horses, the Spanish and Italian mares are best; but for draught-horses, those of Britain and Normandy are preferable. However, when the stallions are good, the mares of any country will produce fine horses, provided they be well made and of a good breed.

Mares go with young 11 months and some days. They bring forth standing; contrary to the course of most other quadrupeds, who lie during this operation. They continue to bring forth till the age of 16 or 18 years; and both horses and mares live between 25 and 30 years. Horses cast their hair once a-year, generally in the spring, but sometimes in the autumn. At this time they are weak, and require to be better fed and taken care of than at any other season.

In Persia, Arabia, and most eastern countries, they never geld their horses, as is done in Europe and China. This operation greatly diminishes their strength, courage, and spirit; but it makes them good humoured, gentle, and tractable. With regard to the time of performing this operation, the practice of different countries is different: some geld their horses when a year old, and others at 18 months. But the best and most general practice is to delay the operation till they be

Equus.

be two years old at least: because, when the gelding is delayed for two years or more, the animals retain more of the strength and other qualities which naturally belong to the male.

As the utility of horses surpasses that of all other domestic animals, it may be of use to subjoin some marks by which the age and other properties of horses may be distinguished.

In old horses, the eye-pits are generally deep; but this is only an equivocal mark, being also found in young horses begot by old stallions. The most certain knowledge of the age is to be obtained from the teeth. Of these a horse has 40; 24 grinders or double-teeth, four tushes, and 12 fore-teeth: mares have no tushes, or at least very short ones. It is not from the grinders that we know the age; it is discovered first by the fore-teeth, and afterwards by the tushes. The 12 fore-teeth begin to shoot within 12 days after the colt is foaled. These first, or foal-teeth, are round, short, not very solid, and are cast at different times, to be replaced by others. At the age of two years and a half, the four middle fore-teeth are cast, two in the upper jaw, and two in the lower. In one year more, four others drop out, one on each side of the former, which are already replaced. When he is about four years and a half old, he sheds four others, and always next to those which have fallen out and been replaced. These four foal-teeth are replaced by four others, but are far from growing so fast as those which replaced the eight former, and are called the *corner-teeth*; they replace the four last foal-teeth, and by these the age of a horse is discovered. They are easily known, being the third both above and below, counting from the middle of the jaw. They are hollow, and have a black mark in their cavity. When the horse is four years and a half old, they are scarce visible above the gum, and the cavity is very sensible: at six and a half, they begin to fill; and the mark continually diminishes and contracts till seven or eight years, when the cavity is quite filled up, and the black spot effaced. After eight years, these teeth ceasing to afford any knowledge of the age, it is judged of by the tushes: which are four teeth adjoining to those last mentioned; and, like the grinders, are not preceded by any other teeth. The two in the lower jaw usually begin to shoot at three years and a half, and those of the upper jaw at four; continuing very sharp-pointed till six. At 10, the upper seem blunted, worn out, and long, the gum contracting itself as its years increase; the barer therefore they are, the older is the horse. From 10 to 13 or 14 years, little can be seen to indicate the age; but at that time some hairs of the eye-brows begin to turn grey. This mark, however, is equivocal, like that drawn from the depth of the eye-pits; horses from old stallions or mares, having grey hairs in the eye-brows when they are not above nine or ten years old. In some horses the teeth are of such a hardness as not to wear; and in such the black mark always subsists, being never effaced by time: but the age of these horses, which are called *beguts* by the French, is easily known; the hollow of the tooth being filled up, and at the same time the tushes very long. It has been farther observed, that this is more common in mares than in horses. The age of a horse may be also known, though less accu-

Equus. rately, by the bars in his mouth, which wear away as he advances in years.

When the horse is without blemish, the legs and thighs are clean, the knees straight, the skin and shank thin, and the back-sinew strong and well-braced. The sinews and the bones should be so distinct, as to make the legs appear thin and lathy, not full and round. The pastern joints should never be large and round; nor must there be any swelling near the coronet. The hock should be lean and dry, not puffed up with wind. With regard to the hoof, the coronet should be equally thick, and the horn shining and greyish. A white horn is a sign of a bad foot, for it will wear out in a short time; and likewise when the horn is thin, it is liable to be spoiled in shoeing, and by travelling hard on stony grounds. This is best known when the shoe is taken off; for then the verge all round the sole will appear thin, and the horse will wince at the least touch of the pincers.

A strong foot has the fibres of the hoof very distinct running in a direct line from the coronet to the toe, like the grain of wood. In this case, care must be taken to keep the foot moist and pliable. The greatest inconvenience attending a hard strong foot, is its being subject to rifts and fissures, which cleave the hoof quite through sometimes from the coronet down to the bottom.

A narrow heel is likewise a defect; and when it is not above two fingers in breadth, the foot is bad. A high heel causes a horse to trip and stumble often; and the low one, with long yielding pasterns, is very apt to be worn quite away on a journey. Too large a foot in proportion to the rest of the body, renders a horse weak and heavy.

The head of a horse should be small, and rather lean than fleshy. The ears should be small, erect, thin, sprightly, and pointed. The forehead, or brow, should be neither too broad nor too flat, and should have a star or snip thereon. The nose should rise a little, and the nostrils should be wide that he may breathe more freely. The muzzle should be small, and the mouth neither too deep nor too shallow. The jaws should be thin, and not approach too near together at the throat, nor too high upwards towards the onset, that the horse may have sufficient room to carry his head in an easy graceful posture. The eyes should be of a middle size, bright, lively, and full of fire. The tongue should be small, that it may not be too much pressed by the bit; and it is a good sign when his mouth is full of white froth, for it shows that he will not soon be overheated.

The neck should be arched towards the middle, growing smaller by degrees from the breast and shoulders to the head. The hair of the main should be long, small, and fine; and if it be a little frizzled, so much the better. The shoulders should be pretty long; the withers thin, and enlarge gradually from thence downwards; but so as to render his breast neither too narrow nor too gross. A thick-shouldered horse soon tires, and trips and stumbles every minute; especially if he has a thick large neck at the same time. When the breast is so narrow that the fore-thighs almost touch, they are never good for much. A horse of a middle size should have the distance of five or six inches

Equus. between his fore-thighs, and there should be less distance between his feet than his thighs near the shoulders when he stands upright.

The body or carcase of a horse should be of a middling size in proportion to his bulk, and the back should sink a little below the withers; but the other parts should be straight, and no higher behind than before. He should also be home-ribbed; but the short ribs should not approach too near the haunches, and then he will have room to fetch his breath. When a horse's back is short in proportion to his bulk, and yet otherwise well limbed, he will hold out a journey, tho' he will travel slow. When he is tall, at the same time with very long legs, he is but of little value.

The wind should never be overlooked in the choice of a horse: and it may easily be known by his flanks, if he is broken-winded, when he stands quiet in the stable; because he always pinches them in with a very slow motion, and drops them suddenly. A thick-winded horse fetches his breath often, and sometimes rattles and wheezes. This may be always discovered when he is put to brisk exercises.

The temper of a horse should always be observed; a vicious horse generally lays his ears close to his pole, shows the whites of his eyes, and looks fullen and dogged. An angry horse may be known by his frowning looks; and he generally seems to stand in a posture of defence. When he is very vicious, he pays no regard to the groom that feeds him: However, some horses that are ticklish will lay back their ears, and yet be of a good disposition. A fearful horse is apt to start, and never leaves it off till he is old and useless. A fretful horse is very unfit for a journey; and you may discover his temper as soon as he gets out of the stable. A dull, heavy, sluggish horse may be easily known, whatever tricks are used to rouse his spirits.

With regard to the colour of a horse, the bright bay, and indeed all kinds of bays in general, are accounted good colours. The chestnut horse is generally preferable to the sorrel, unless the former happens to be bald, or party-coloured, with white legs. Brown horses have generally black manes and tails, and their joints are of a rusty black. Those of this colour that are dappled, are much handsomer than the rest. Horses of a shining black, and well marked without too much white, are in high esteem for their beauty. A star, or blaze, or white muzzle, or one or more feet tipped with white, are thought to be rather better than those that are quite black.

Of greys, the dappled are accounted best; though the silver grey make a more beautiful appearance, and often prove good. The iron grey with white manes and tails are thought not to be so hardy. Greys of every kind will turn white sooner or later; but the nutmeg grey, when the dappled parts incline to bay or chestnut, are said to be good hardy horses. Roan horses have a diversity of colours mixed together; but the white is more predominant than the rest. They are all generally hardy, and fit for the road; and some are exceeding good. Those of a strawberry colour most resemble the sorrel, and they are often marked with white on the face and legs. When the bay is blended with it, he seems to be tintured with claret; and some of these prove to be very good. Dun, fallow, and

Equus. cream-coloured horses have a list down their backs; and their manes and tails are black. Dun horses are seldom chosen by gentlemen, and yet they may be very useful to the country farmer. The fallow and cream-coloured are more esteemed, both for beauty and use. Those horses that are finely spotted with gay colours like leopards are a great rarity, and for that reason are only in the hands of great men.

There is some difference in horses according to the different countries where they are bred. For instance, in France, those of Bretagne are pretty strong made, and have generally black hair, or brown bay; and they have good legs and feet, with a hardy mouth, and a head short and fleshy; but in general they are pretty clumsy. The horses of Franche Comté are said to have the legs of tigers, and the belly of a hind; but they are short and thick, and of a middle size; being much more proper for drawing than riding. The horses of Gascony are not unlike those of Spain; but they are not so handsome nor so active, and therefore they are more proper to draw carriages. The Limousin horses are very vicious, and are good for little till they are six years old. Their colour is generally bay, or a bay brown. The horses of Normandy are much like those of Bretagne; and those of Poitou have good bodies, legs, feet, and eyes; but they are far from being handsome.

The horses of Germany are much better and more handsome than those of the Low Countries. They are of great use for carriages; but much more for the army, and for drawing the artillery. They have a great deal of hair, especially about the legs. They are not large, but they are well set; and yet they have tender feet. The Hungarian horses are excellent for the coach, as well as for riding: but they are large, though well proportioned; and they are of all colours, and in general very swift.

The Danish horses are low; short, and square; but they have a fine head, and short hair. The horses of the Low Countries are very fit for the coach, and they are best known by the name of *Flanders-mares*. The Polish horses are like the Danish; only they have not so fine a fore-hand; their colour is generally a bright bay, and that of the outward peel of an onion; and they are fiery and vicious. The horses of Switzerland are pretty much like those of Germany; which is no wonder, since the Germans purchase a great number of them. The horses of Piedmont are fiery, of a middle size, and of all sorts of colours; their legs are good and handsome, their eyes fine, their ears small, and their mouths good; but they do not carry their heads well.

The horses of Naples and Italy are generally ill-made and lean; and yet they are good and useful, for they are light and proper for racing, though not for a long course; they never do well in a colder climate. The Spanish horses are very well made and handsome, as well as very active and nimble; they have good eyes, handsome legs and heads, and are easily managed; they are also good for racing, if they are well kept: however, they are not so good in northern climates as in their own country. The Turkish horses are of different shapes; but they are generally swift, tho' their mouths are bad. Most of them are white; tho' there

Equus. there are other colours; and they are large, hardy, strong, and fit for the road.

The horses of Barbary, commonly called *barbs*, have strong hoofs, and are more proper for racing than any others whatever: some have said they never grow old, because they preserve their vigour to the last. They are excellent stallions; and some of them are used as such in Britain: however, the Arabian horses are not quite so good as the Barbary, though some think they are both of the same kind; only those that are used to the deserts of Arabia are always in action. The horses of the Gold Coast of Guinea are very few in number, and in other parts of that coast there are none at all; for many of the negroes, when they have been first brought over to our American plantations, have expressed great admiration at the sight of a horse, and even been afraid to come near one.

The horses of the Cape of Good Hope were originally brought from Persia: and they are generally small, and of a chestnut colour; for those that are natives of that country are all wild, and could never yet be tamed. The horses of China are good, and more particularly those in the province of Yun Nan; for they are very vigorous, though a little low. The horses of the Eluth Tartars are good and full of fire; and their size is much the same as the Polish horses: they are afraid of nothing; not even of lions and tigers: but perhaps this may be owing to use. In the country of the Mogul they are very numerous, and of all colours: they are generally of the middle size, though there are some as large and as handsome as those in Europe. The wild horses of Tartary differ very little from the tame; but they are so swift, that they avoid the arrows of the most skilful hunters.

The breed of horses in Great Britain is as mixed as that of its inhabitants: the frequent introduction of foreign horses has given us a variety that no single country can boast of: most other countries produce only one kind; while ours, by a judicious mixture of the several species, by the happy difference of our soils, and by our superior skill in management, may triumph over the rest of Europe, in having brought each quality of this noble animal to the highest perfection.

In the annals of Newmarket may be found instances of horses that have literally outstripped the wind, as the celebrated M. Condamine has lately shown in his remarks on those of Great Britain. Childers is an amazing instance of rapidity; his speed having been more than once exerted equal to 82½ feet in a second, or near a mile in a minute.

The species used in hunting, is a happy combination of the former with others superior in strength, but inferior in point of speed and lineage: an union of both is necessary; for the fatigues of the chase must be supported by the spirit of the one, as well as by the vigour of the other.

No country can bring a parallel to the strength and size of our horses destined for the draught; or to the activity and strength united of those that form our cavalry. In London, there are instances of single horses that are able to draw on a plain, for a small space, the weight of three tuns; but could with ease, and for a continuance, draw half that weight. The pack-horses of Yorkshire, employed in conveying the manufactures

of that country to the most remote parts of the kingdom, usually carry a burden of 420 pounds; and that indifferently over the highest hills of the north, as well as the most level roads. But the most remarkable proof of the strength of our British horses, is to be drawn from that of our mill-horses: some of these will carry at one load 13 measures, which at a moderate computation of 70 pounds each, will amount to 910; a weight superior to that which the lesser sort of camels will bear: this will appear less surprising, as these horses are by degrees accustomed to the weight; and the distance they travel no greater than to and from the adjacent hamlets.

Our cavalry, in the late campaigns (when they had opportunity), showed over those of our allies, as well as of the French, a great superiority both of strength and activity: the enemy was broken through by the impetuous charge of our squadrons; while the German horses, from their great weight and inactive make, were unable to second our efforts; though those troops were actuated by the noblest ardour.

The present cavalry of this island only supports its ancient glory. It was eminent in the earliest times: our scythed chariots, and the activity and good discipline of our horses, even struck terror into Cæsar's legions: and the Britons, as soon as they became civilized enough to coin, took care to represent on their money the animal for which they were so celebrated. It is now impossible to trace out this species; for those which exist among the *indigene* of Great Britain, such as the little horses of Wales and Cornwall, the hobbies of Ireland, and the shelties of Scotland, though admirably well adapted to the uses of those countries, could never have been equal to the work of war: but probably we had even then a larger and stronger breed in the more fertile and luxuriant parts of the island. Those we employ for that purpose, or for the draught, are an offspring of the German or Flemish breed, meliorated by our soil and a judicious culture.

The English were ever attentive to an exact culture of these animals; and in very early times set a high value on their breed. The esteem that our horses were held in by foreigners so long ago as the reign of Athelstan, may be collected from a law of that monarch, prohibiting their exportation, except they were designed as presents. These must have been the native kind, or the prohibition would have been needless; for our commerce was at that time too limited to receive improvement from any but the German kind, to which country their own breed could be of no value. But when our intercourse with the other parts of Europe was enlarged, we soon laid hold of the advantages this gave of improving our breed. Roger de Belesme, earl of Shrewsbury, is the first that is on record: he introduced the Spanish stallions into his estate in Pow-island, from which that part of Wales was for many ages celebrated for a swift and generous race of horses. Giraldus Cambrensis, who lived in the reign of Hen. II. takes notice of it; and Michael Drayton, cotemporary with Shakespear, sings their excellence in the sixth part of his Polyolbion. This kind was probably destined to mount our gallant nobility, or courteous knights for feats of chivalry, in the generous contests of the tilt-yard. From these sprung, to speak the language of the times, the flower of coursers, whose elegant form added charms.

Equus.

Equus.

charms to the rider, and whose activity and managed dexterity gained him the palm in that field of gallantry and romantic honour.

The increase of our inhabitants, and the extent of our manufactures, together with the former neglect of internal navigation to convey those manufactures, multiplied the number of our horses: an excess of wealth, before unknown in these islands, increased the luxury of carriages, and added to the necessity of an extraordinary culture of these animals: their high reputation abroad has also made them a branch of commerce, and proved another cause of their vast increase.

The all-wise Creator hath finely limited the several services of domestic animals towards the human race; and ordered that the parts of such, which in their lives have been the most useful, should after death contribute the least to our benefit. The chief use that the *exuvie* of the horse can be applied to, is for collars, traces, and other parts of the harness; and thus, even after death, he preserves some analogy with his former employ. The hair of the mane is of use in making wigs; of the tail, in making the bottoms of chairs, floor-cloths, and chords; and to the angler in making lines.

Plate
CLXXXIII.

TECHNICAL DESCRIPTION of the Parts of a HORSE.

The Fore Part. 1. The forehead. 2. The temples. 3. Cavity above the eye. 4. The jaw. 5. The lips. 6. The nostrils. 7. The tip of the nose. 8. The chin. 9. The beard. 10. The neck. 11. The mane. 12. The fore-top. 13. The throat. 14. The withers. 15. The shoulders. 16. The chest. 17. The elbow. 18. The arm. 19. The plate vein. 20. The chestnut. 21. The knee. 22. The shank. 23. The main tendons. 24. The fetlock joint. 25. The fetlock. 26. The pastern. 27. The coronet. 28. The hoof. 29. The quarters. 30. The toe. 31. The heel.—*The Body.* 32. The reins. 33. The fillets. 34. The ribs. 35. The belly. 36. The flanks.—*The Hind Part.* 37. The rump. 38. The tail. 39. The buttocks. 40. The haunches. 41. The stifle. 42. The thighs. 43. The hock. 44. The kerb. 45. The point of the hock.

For the breeding, rearing, &c. of horses, see the articles, COLT, HORSE, and STALLION; for the method of training and managing them, see HORSEMANSHIP; and for their diseases and cure, see FARRIERY.

2. The *Asinus*, or *Ass*, has long slouching ears, short mane, tail covered with long hairs at the end. The body is usually of an ash colour, with a black bar cross the shoulders.

The *Koulan*, or ass in a wild state (the *onager* of the ancients), varies from the tame in several respects, and requires a more particular description. The forehead is very much arched: the ears are erect, even when the animal is out of order; sharp-pointed, and lined with whitish curling hairs; the irides are of a livid brown; the lips thick; and the end of the nose sloping steeply down to the upper lip: the nostrils are large and oval. It is much higher on its limbs than the tame ass, and its legs are much finer, but it again resembles it in the narrowness of its chest and body: it carries its head much higher; and its skull is of a surprising thinness. The mane is dusky, about three or four inches long, compo-

sed of soft woolly hair, and extends quite to the shoulders: the hairs at the end of the tail are coarse, and about a span long. The colour of the hair in general is a silvery white; the upper part of the face, the sides of the neck and body, are of a flaxen-colour; the hind part of the thighs are the same; the fore part divided from the flank by a white line, which extends round the rump to the tail: the belly and legs are also white: along the very top of the back, from the mane quite to the tail, runs a stripe of bushy waved hairs of a coffee-colour, broadest above the hind part, growing narrower again towards the tail; another of the same colour crosses it at the shoulders (of the males only), forming a mark, such as distinguishes the tame asses: the dorsal band and the mane are bounded on each side by a beautiful line of white, well described by Oppian, who gives an admirable account of the whole. Its winter coat is very fine, soft, and silky, much undulated, and likest to the hair of the camel; greasy to the touch: and the flaxen colour, during that season, more exquisitely bright. Its summer coat is very smooth, silky, and even, with exception of certain shaded rays that mark the sides of the neck, pointing downwards.

These animals inhabit the dry and mountainous parts of the deserts of Great Tartary, but not higher than lat. 48. They are migratory, and arrive in vast troops to feed, during the summer, in the tracts east and north of lake Aral. About autumn they collect in herds of hundreds, and even thousands, and direct their course towards the north of India, to enjoy a warm retreat during winter. But Persia is their most usual place of retirement: where they are found in the mountains of Casbin, some even at all times of the year. If we can depend on Barboga, they penetrate even into the southern parts of India, to the mountains of Malabar and Golconda. According to Leo Africanus, wild asses of an ash-colour are found in the deserts of northern Africa. The Arabs take them in snares for the sake of their flesh. If fresh killed, it is hot and unsavory: if kept two days after it is boiled, it becomes excellent meat. These people, the Tartars and Romans, agreed in their preference of this to any other food: the latter indeed chose them young, at a period of life in which it was called *Lalisio*; (vide *Martial*. xiii. 97.) The epicures of Rome preferred those of Africa to all others. The grown onagri were introduced among the spectacles of the theatre; and their combats were preferred even to those of the elephants.

The manners of the wild ass are very much the same with those of the wild horse and the *dshikketei*. They assemble in troops under the conduct of a leader; and are very shy. They will, however, stop in the midst of their course, and even suffer the approach of man at that instant, but will then dart away with the rapidity of an arrow dismissed from the bow. This Herodotus speaks to, in his account of those of Mesopotamia; and Leo Africanus, in that of the African.

They are extremely wild. Holy writ is full of allusions to their savage nature. "He scorneth the multitude of the city, neither regardeth he the crying of the driver," (Job xxxix. 7.). Yet they are not untameable. The Persians catch and break them for the draught: they make pits, half-filled with plants to lessen the fall, and take them alive. They break, and

Equus.

Equus.

hold them in great esteem, and sell them at a high price. The famous breed of asses in the east is produced from the koulan reclaimed from the savage state, which highly improves the breed. The Romans reckoned the breed of asses produced from the onager and tame ass to excel all others. The Tartars, who kill them only for the sake of the flesh and skins, lie in ambush and shoot them. They have been at all times celebrated for their amazing swiftness; for which reason the Hebrews called them *Pere*; as they styled them *Arod* from their braying. Their food is the saltiest plants of the deserts, such as the kalis, atriplex, chenopodium, &c.; and also the bitter milky tribe of herbs: they also prefer salt-water to fresh. This is exactly conformable to the history given of this animal in the book of Job; for the words "barren land", expressive of its dwelling, ought, according to the learned Bouchart, to be rendered "salt places." The hunters lie in wait for them near the ponds of brackish water, to which they resort to drink: but they are not of a thirsty nature, and seldom have recourse to water. These animals were anciently found in the Holy Land, Syria, the land of Uz or Arabia Deserta, Mesopotamia, Phrygia, and Lycaonia. But at present they are entirely confined to the countries above mentioned. Chagrin, a word derived from the Tartar *soghré*, is made of the skin of these animals, which grows about the rump, and also those of horses, which is equally good. There are great manufactures of it at Astracan and in all Persia. It is a mistake to suppose it to be naturally granulated, for its roughness is entirely the effect of art. The Persians use the bile of the wild ass as a remedy against the dimness of sight: and the same people, and the Nogayan Tartars, have been known to endeavour the most infamous bestialities with it, in order to free themselves from the disorders of the kidneys.

The tame or *domestic ass*, is a humble, patient, and tranquil, animal. He submits with firmness to strokes and chastisement: he is temperate both as to the quantity and quality of his food; he contents himself with the rigid and disagreeable herbage which the horse and other animals leave to him and disdain to eat: he is more delicate with regard to his drink, never using water unless it be perfectly pure. As his master does not take the trouble of combing him, he often rolls himself on the turf among thistles, ferns, &c. Without regarding what he is carrying, he lies down to roll as often as he can, seeming to reproach his master for neglect and want of attention. When very young, the ass is a gay, sprightly, nimble, and gentle animal. But he soon loses these qualities, probably by the bad usage he meets with; and becomes lazy, untractable, and stubborn. When under the influence of love, he becomes perfectly furious. The affection of the female for her young is strong: Pliny assures us, that when an experiment was made to discover the strength of maternal affection in a she-ass, she run through the flames in order to come at her colt. Although the ass be generally ill used, he discovers a great attachment to his master; he smells him at a distance, searches the places and roads he used to frequent, and easily distinguishes him from the rest of mankind. The ass has a very fine eye, an excellent scent, and a good ear. When overloaded, he hangs his head, and sinks his

ears: when too much teased or tormented, he opens his mouth and retracts his lips in a disagreeable manner, which gives him an air of ridicule and derision. If you cover his eyes, he will not move another step; if you lay him on his side, and place his head so that one eye rests on the ground, and cover the other with a cloth, he will remain in this situation without making any attempt to get up. He walks, trots, and gallops in the same manner as the horse; but all his motions are slower. Whatever be the pace he is going at, if you push him, he instantly stops.

The cry of the horse is known by the name of *neighing*; that of the ass, by *braying*, which is a long, disagreeable noise, consisting of alternate discords from sharp to grave and from grave to sharp; he seldom cries but when pressed with hunger or love: the voice of the female is clearer and more piercing than that of the male.

The ass is less subject to vermin than other animals covered with hair; he is never troubled with lice, probably owing to the hardness and dryness of his skin; and it is probably for the same reason that he is less sensible to the whip and spur than the horse. The teeth of the ass fall out and grow at the same age and in the same manner as those of the horse; and he has nearly the same marks in his mouth.

Asses are capable of propagating when two years old. The females are in season during the months of May and June. The milk appears in the dugs ten months after impregnation; she brings forth in the twelfth month, and always one at a time. Seven days after the birth, the season of the female returns, and she is again in a condition to receive the male. The colt should be taken from her at the end of five or six months, that the growth and nourishment of the fetus may not be obstructed. The stallion or jack-ass should be the largest and strongest that can be found; he should be at least three years old, and never ought to exceed ten. The ass, like the horse, takes three or four years in growing, and lives till he be 25 or 30: he sleeps less than the horse, and never lies down to sleep but when excessively fatigued. He is more robust, and less subject to diseases, than the horse.

Travellers inform us that there are two sorts of asses in Persia; one of which is used for burdens, they being slow and heavy: the other is kept like horses for the saddle; for they have smooth hair, carry their head well, and are much quicker in their motion; but when they ride them, they sit nearer their buttocks than when on a horse: they are dressed like horses, and are taught to amble like them; but they generally cleave their nostrils to give them more room for breathing. Dr Russel likewise tells us they have two sorts in Syria; one of which is like ours; and the other very large, with remarkable long ears; but they are both put to the same use, which is, to carry burdens.

In America there were originally no asses at all, nor yet horses: but they were carried thither long ago, at first by the Spaniards, and afterwards by other nations, where they multiplied greatly; insomuch, that, in some places, there are whole droves of them that run wild, and are very hard to be caught. Asses in general carry the heaviest burdens in proportion to their bulk; and, as their keeping costs little or nothing, it

Equus.

Equus. is a great wonder that they are not put to more uses than they generally are among us. The flesh of the common ass is never eaten in these parts of the world; though some pretend their colts are tender, and not disagreeable.

3. The *Hemionus* of Pallas, or WILD MULE, is of the size and appearance of the common mule; with a large head, flat forehead growing narrow toward the nose, eyes of a middle size, the irides of an obscure ash-colour; 38 teeth in all, being two in number fewer than in a common horse; ears much longer than those of a horse, quite erect, lined with a thick whitish curling coat; neck slender, compressed; mane upright, short, soft, of a greyish colour; in place of the foretop, a short tuft of downy hair about an inch and three quarters long. The body is rather long, and the back very little elevated; the breast protuberant and sharp. The limbs are long and elegant; the thighs thin, as in a mule's. Within the fore-legs there is an oval callus; in the hind legs none. The hoofs are oblong, smooth, and black; the tail is like that of a cow, slender, and for half of its length naked, the rest covered with long ash-coloured hairs. Its winter coat grey at the tips, of a brownish ash-colour beneath; about two inches long, in softness like the hair of a camel, and undulated on the back. Its summer coat is much shorter, of a most elegant smoothness, and in all parts marked most beautifully with small vortexes. The end of the nose is white; from thence to the foretop inclining to tawny. The buttocks are white; as are the inside of the limbs and belly. From the mane a blackish testaceous line extends along the top of the back to the tail, broadest on the loins, and growing narrower towards the tail. The colour of the upper part of the body is a light yellowish grey, growing paler towards the sides. The length, from the tip of the nose to the base of the tail, is six feet seven inches; length of the trunk of the tail one foot four; of the hairs beyond the end, eight inches. The height of the animal is three feet nine. This species inhabits the deserts between the rivers Onon and Argun in the most southern part of Siberia, and extends over the vast plains and deserts of western Tartary, and the celebrated sandy desert of Gobi, which reaches even to India. In Siberia they are seen only in small numbers, as if detached from the numerous herds to the south of the Russian dominions. In Tartary they are particularly conversant about Taricnoor, a salt lake at times dried up. They shun wooded tracts and lofty snowy mountains. They live in separate herds, each consisting of a chief, a number of mares and colts, in all to the number of about 20; but seldom so many, for commonly each male has but five and sometimes fewer females. They copulate towards the middle or end of August; and bring for the most part but one at a time, which by the third year attains its full growth, form, and colour. The young males are then driven away from their paternal herds, and keep at a distance till they can find mates of their own age which have quitted their dams. These animals always carry their heads horizontally; but when they take to flight, hold them upright, and erect their tail. Their neighing is deeper and louder than that of a horse. They fight by biting and kicking, as usual with the horse: they are fierce and untameable; and even those which

N^o 118.

have been taken young, are so intractable as not to be broken by any art which the wandering Tartars could use. Yet was it possible to bring them into fit places, and to provide all the conveniences known in Europe, the task might be effected: but it is doubted whether the subdued animal would retain the swiftness it is so celebrated for in its state of nature. It exceeds that of the antelope; it is even proverbial; and the inhabitants of Thebet, from the fame of its rapid speed, mount on it Chammo their god of fire. The Mongolians despair of ever taking them by the chase; but lurk behind some tomb, or in some ditch, and shoot them when they come to drink or eat the salt of the desert. They are excessively fearful animals, and provident against danger. A male takes on him the care of the herd, and always is on the watch. If they see a hunter, who by creeping along the ground has got near them, the sentinel takes a great circuit, and goes round and round him, as discovering somewhat to be apprehended. As soon as the animal is satisfied, it rejoins the herd, which sets off with great precipitation. Sometimes its curiosity costs it its life; for it approaches so near as to give the hunter an opportunity of shooting it. But it is observed, that in rainy or in stormy weather, these animals seem very dull, and less sensible of the approach of mankind. The Mongolians and Tungusi, according to Du Halden, kill them for the sake of the flesh, which they prefer to that of horses, and even to that of the wild boar, esteeming it equally nourishing and wholesome. The skin is also used for the making of boots. Their senses of hearing and smelling are most exquisite: so that they are approached with the utmost difficulty. The Mongolians call them *dsbikketaei*, which signifies "the eared;" the Chinese, *yo to tse*, or "mule." In ancient times the species extended far to the south. It was the hemionos or half ass of Aristotle, found in his days in Syria, and which he celebrates for its amazing swiftness and its fecundity, a breeding mule being thought a prodigy; and Pliny, from the report of Theophrastus, speaks of this species being found in Cappadocia, but adds they were a particular kind.

The domestic MULES of present times (*equus mulus* of Gesner and Linnæus) are the offspring of the horse and the ass, or ass and mare; are very hardy, and have more the form and disposition of the ass than the horse. The finest are bred in Spain; very large ones in Savoy.

4. The ZEBRA. This animal has the figure and gracefulness of the horse, joined to the swiftness of the stag. He is about seven feet long, from the point of the muzzle to the origin of the tail, and about four feet high. The colour of his skin is beautiful and uniform, consisting of alternate parallel rings of black and white, disposed in the most regular manner, as represented in the plate. He is generally less than the horse and larger than the ass. The zebra is found nowhere but in the eastern and southern provinces of Africa, from Ethiopia to the Cape of Good Hope, and from the Cape of Good Hope to Congo. The Dutch have been at great pains to tame and use them for domestic purposes, but with little success. He is hard-mouthed, and kicks when any person attempts to touch or come near him. He is restless and obstinate as a mule: but perhaps the wild horse is naturally as

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Erasmus.

untractable as the zebra; for it is probable, if he were early accustomed to obedience and a domestic life, he would become as docile as the horse.

5. The quacha, or quagga, is striped like the former on the head and body, but with fewer lines. The flanks are spotted; the rump is plain; the ground colour of the head, neck, body, and rump, a bright bay: the belly, thighs, and legs are white, and free from all marks. This species, till of late, has been supposed to be the female of the zebra; but recent observations prove that the male and female zebra are marked alike. This differs likewise in being thicker and stronger made, and in being more tractable; for instance, one had been so far broken as to draw in a cart. The Hottentots also distinguish them from the former, by the names of *quagga* and *opeagha*.

ERA, in chronology. See *ÆRA*.

ERANARCHA, a public officer among the ancient Greeks, whose business was to preside over and direct the alms and provisions made for the poor. Cornelius Nepos, in his life of Epaminondas, describes his office thus: When any person was reduced to poverty, taken captive, or had a daughter to marry, which he could not effect for want of money, &c. the eranarcha called an assembly of friends and neighbours, and taxed each according to his means and estate, to contribute towards his relief.

ERANTHEMUM, in botany: A genus of the monogynia order, belonging to the diandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is quinquefid, with the tube filiform; the antheræ without the tube; the stigma simple.

ERASISTRATUS, a celebrated physician, grandson to the philosopher Aristotle. He discovered by the motion of the pulse the love which Antiochus had conceived for his mother-in-law Stratonice, and was rewarded with 100 talents for the cure by the father of Antiochus. He was a great enemy to bleeding and violent physic.

ERASMUS (Desiderius), born at Rotterdam in 1467. He lost his father and mother at 14 years of age; and was committed to the care of certain guardians, who would force him to be an ecclesiastic, which he refused for a long time. However, he was obliged to assume the religious habit among the canons regular in the monastery of Stein near Tergou; but afterwards obtained a dispensation from his vows. He was the most learned man of the age in which he lived; and contributed, by his example and his writings, to the restoration of learning in the several countries in which he occasionally resided, viz. Italy, Switzerland, Holland, France, and England: with the last, he was most satisfied; and found the greatest encouragement from Henry VIII. Sir Thomas More, and all the learned Englishmen of those days. He published a great many books; and died at Basil in 1536. He was buried honourably, and his memory is still held in veneration. He had, however, many enemies; and as he did not embrace the reformation, and yet censured many things in popery, he hath been treated injuriously both by Catholics and Protestants. The works of Erasmus in 10 vols folio were published at Leyden in 1706, in a very handsome manner, under the care

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of M. Le Clerc. Dr Jortin published his life in one vol. 4to, 1758.

ERASTIANS, a religious sect or faction which arose in England during the time of the civil wars in 1647, thus called from their leader Thomas Erastus, whose distinguishing doctrine it was, that the church had no right to discipline, that is, no regular power to excommunicate, exclude, censure, absolve, decree, or the like.

ERATO (from *εραω* I love), in mythology, the name of one of the nine muses who presided over love-poetry. To this muse some have ascribed the invention of the lyre and lute; and she is represented with a garland of myrtles and roses, holding a lyre in one hand and a bow in the other, and at her side a Cupid with his torch. There is also a Nereid of the same name.

ERATOSTHENES, a Cyrenæan philosopher, historian, and poet; called for his learning *Plato Minor*. He was keeper of the famous library at Alexandria; and was greatly in favour with Ptolemy Euergetes, by whose order he wrote a history of the Theban kings of Egypt, which succession was entirely omitted by Manetho. He thus fixed the Egyptian chronology, and his authority is by many preferred to that of Manetho. He wrote many other things, a catalogue of which is to be seen in Fabricius, Vossius, &c. but his only piece now remaining entire is a description and fabulous account of the stars. He starved himself in old age through grief for the dimness of his sight, about the 10th or 12th year of Ptolemy Epiphanes, 194 B. C.

ERATOSTRATUS, an Ephesian who burnt the famous temple of Diana the same night that Alexander the Great was born. This burning, as some writers have observed, was not prevented or seen by the goddess of the place, who was then present at the labours of Olympias, and at the birth of the conqueror of Persia. Eratosthratus did this villany merely to eternize his name by so uncommon an action.

EREBUS (*Ερεβος*, from *ערב* night), in mythology, a term denoting darkness. According to Hesiod, Erebus was the son of Chaos and the night, and the father of the day. This was also the name of part of the *inferi* among the ancients: they had a peculiar expiation for those who were detained in Erebus.

Erebus was properly the gloomy region, and distinguished both from Tartarus the place of torment, and Elysium the region of bliss: according to the account given of it by Virgil, it forms the third grand division of the invisible world beyond the Styx, and comprehends several particular districts, as the *limbus infantum*, or receptacle for infants; the *limbus* for those who have been put to death without cause; that for those who have destroyed themselves; the fields of mourning, full of dark groves and woods, inhabited by those who died for love; and beyond these, an open champaign country for departed warriors.

ERECTION, in a general sense, the art of raising or elevating any thing; as the erection of a perpendicular, &c. It is also used in a figurative sense; as the erection of a bishopric, marquissate, &c.

ERECTION is particularly used by medical writers for the state of the penis when swelled and distended.

Erastians
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Erection.

Ermit
||
Erica.

by the action of the muscles called *erectores*. See ANATOMY, p. 739.

There is also an erection of the clitoris which is performed by muscles for that purpose.

EREMIT. See HERMIT.

ERETRIA (anc. geog.), a town of Eubœa, situated on the Euripus, in the south-west of the island. A very ancient city, and the largest of the island, after Chalcis. After being demolished by the Persians, it was restored on an adjoining spot, according to Strabo, who mentions a school of Eretrian philosophers there. The Abantes of Homer were of Eubœa.

ERFORT, a town of Germany, in the circle of Upper Saxony, the capital of Thuringia, and subject to the elector of Mentz. It is defended by good ramparts; and has a castle on an eminence, which commands the town. Its inhabitants are almost all Lutherans, but its principal churches belong to the Catholics. There are several handsome structures, both public and private; but the houses in general are but indifferently built. E. Long. 11. 14. N. Lat. 50. 49.

ERGASTULUM, among the Romans, was a prison, work-house, or house of correction, where slaves by the private authority of their masters were confined and kept for their offences to hard labour. The Greeks had a place of confinement of this sort called *εργαστήριον*.

ERGOT, in farriery, is a stub, like a piece of soft horn, about the bigness of a chesnut, placed behind and below the pastern-joint, and commonly hid under the tuft of the fetlock.

ERICA, HEATH, in botany: A genus of the monogynia order, belonging to the octandria class of plants; and in the natural method ranking under the 18th order, *Bicornes*. The calyx is tetraphyllous; the corolla quadrifid; the filaments inserted into the receptacle; the antheræ bifid; the capsule quadrilocular. Of this there are four species, natives of Britain; which are so well known, that no description needs be given of them. In the Highlands of Scotland this plant is made subservient to a great variety of purposes. The poorer inhabitants make walls for their cottages with alternate layers of heath and a kind of mortar made of black earth and straw. The woody roots of the heath are placed in the centre; the tops externally and internally. They make their beds of it, by placing the roots downwards; and the tops only being uppermost, they are sufficiently soft to sleep upon. Cabbins are also thatched with it. In the island of Ulay, ale is frequently made by brewing one part of malt and two of the tops of young heath; sometimes adding hops. Boethius relates, that this liquor was much used by the Picts. Woollen cloth boiled in alum water, and afterwards in a strong decoction of heath-tops, comes out of a fine orange colour. The stalks and tops will tan leather. Besoms and faggots to burn in ovens are also made of this plant. It is also used for filling up drains that are to be covered over. Sheep and goats will sometimes eat the tender shoots, but they are not fond of them. Cattle not accustomed to feed on heath, give bloody milk; but they are soon relieved by drinking plentifully of water. Horses will eat the tops. Bees extract a great deal of honey from

the flowers; and, where heath abounds, the honey has a reddish cast. There are many exotic species with which our green-house collections are enriched and adorned, as the triflora, tubiflora, australis, &c.

ERIDANUS (anc. geog.) a river of Attica, falling into the Ilissus.—Another Eridanus, the more ancient name of the Padus, an appellation ascribed by Pliny to the Greeks; followed in this by Virgil. It rises in mount Vesulus, in the Alpes Cottise, and dividing the Cisalpine Gaul into the Cispadana and Transpadana, and swelled on each hand with no inconsiderable rivers from the other Alps and the Apennine, falls at seven mouths into the Adriatic. Famous in mythology, from the story of Phaëton; whose sisters, the Heliades, were here changed into poplars, according to Ovid.

ERIDANUS, in astronomy, a constellation of the southern hemisphere, in form of a river.—The stars in the constellation Eridanus, in Ptolemy's catalogue, are 34; in Tycho's, 19; and in the British Catalogue, 84.

ERIE, a vast lake to the westward of Pennsylvania, in North America, situated between 80° and 87° W. Long. and between 41° and 42° N. Lat.

ERIGENA, or SCOTUS, (John), a famous scholastic divine, born about the beginning of the ninth century; but where, is a matter of dispute among authors. Bale and Pits say he was born at St David's in Wales; Dempster, Mackenzie, and Henry, that he was born at Ayr in Scotland; which they infer from his names *Erigena* and *Scotus*, by the latter of which he was generally distinguished by his cotemporary writers. But Du Pin and Sir James Ware assert that he was by birth an Irishman; Ireland being in those days called *Scotia*, and by the natives *Erin*. They agree, however, in relating that he travelled to Athens, where he acquired a competent knowledge of the Greek and other oriental languages; and that he afterwards resided many years in the court of Charles the Bald, king of France, who, on account of his singular abilities, treated him as his intimate friend and companion. He slept frequently in the royal apartment; and was constantly admitted to the king's table. "We may judge (says a modern historian) of the freedom which he used with Charles, by the following repartee. As the king and Scotus were sitting one day at table, opposite to each other, after dinner, drinking a cheerful glass, the philosopher having said something that was not quite agreeable to the rules of French politeness, the king in a merry humour asked him, Pray what is between a *Scot* and a *pot*? To which he answered, "Nothing but the table." See *Henry's History of Great Britain*, vol. I. p. 344. who quotes this story from *Hoveden Annal. ad an. 86*. Quer. What language were they talking when this *bon mot* was uttered?

During his residence with Charles, he wrote several books of scholastic divinity; which, though absurd enough, were at that time not sufficiently so to secure him from the imputation of heterodoxy; and on that account the pope commanded Charles the Bald to send him to Rome; but the king had too great a regard for his companion to trust him with his holiness. One of the chief controversies in which Scotus was engaged, and with which the pope was much offended, was concerning the real presence and blood of Christ in the wafer.

Eridanus
||
Erigena.

Erigena
||
Erigone.

wafer. His opinion of this weighty matter is expressed in these few words: "What we receive corporally is not the body of our Lord; but that which feeds the soul and is only perceived by faith." He was also engaged in two other controversies of equal importance, but of a somewhat less delicate nature. The first was, Whether any part of the eucharist be evacuated by stool? and the second, Whether Christ was born of the Virgin Mary *aperta vulva*; Paschasius was of opinion, that this could not be without some injury to her perpetual virginity; and therefore believed that Christ came into the world *per vulvam clausam*, as he came into the place where his disciples were assembled, through the door and not through the wall, without opening the door. Concerning the first of these delicate questions, Scotus with several others declared, that part of the eucharist was certainly evacuated by stool; for which they were honoured with the appellation of *Stercorists*. And as to the second question, he said, that the *vulva clausa* was a dangerous opinion: for it would thence follow, that he was not born, but issued; *non est nasci, sed erumpi*. See Mackenzie, vol. I. p. 55.

Whether this John Scotus returned to England, or ended his days in France, is a matter of doubt. Some of our historians tell us, that he left France in the year 864; and that, after residing about three years in Oxford, he retired to the abbey of Malmesbury, where his scholars stabbed him with their pen-knives. There is no foundation for this story. Probably he died about the year 874; but whether in France or England, is uncertain, and of little importance. Some have related, that he was invited to England by king Alfred: but in this they confound him with John, abbot of Etheling, who was assassinated in 895; and to this mistake the various accounts concerning this author are to be attributed. Regardless of his history, he appears from his writings to have been a man of parts, and, in point of learning, superior to any of his contemporaries. He wrote, 1. *De divisione naturæ*, lib. v. 2. *De predestinatione Dei*. 3. *Excerpta de differentiis & societatibus Græci Latiniq. verbi*. 4. *De corpore et sanguine Domini*. 5. *Ambigua S. Maximi seu scholia ejus in difficiles locos S. Gregorii Nazianzeni, Latine versa*. 6. *Opera S. Dionysii quatuor in Latinam ling. conversa*. All published. 7. *De visione Dei*, and several other works, in manuscript, preserved in different libraries.

ERIGERON, FLEA-BANE, in botany: A genus of the polygamia superflua order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Compositæ*. The receptacle is naked; the pappus hairy; the florets of the radius are linear, and very narrow. There are five species; of which the most remarkable is the viscosum, or male flea-bane of Theophrastus, and greater flea-bane of Dioscorides. It is a native of the south of France and Italy; and hath a perennial root, from whence arise many upright stalks near three feet high. The leaves in warm weather sweat out a clammy juice; the flowers are produced single upon pretty long footstalks, are of a yellow colour, and have an agreeable odour. The plants are easily propagated by seeds; and thrive best in a dry soil and sunny exposure.

ERIGONE, in fabulous history, daughter to Ica-

rius, died of grief for her father's death, was translated into heaven, and makes the sign Virgo. Erinaceus.

ERINACEUS, or HEDGEHOG, in zoology; a genus of quadrupeds belonging to the order of feræ, the characters of which are these: They have two fore-teeth in the upper jaw, at a considerable distance from one another, and two in the under jaw, less distant; and they have two recumbent dog-teeth, one on each side. The hedge-hog has a very uncommon method of defending himself from the attacks of other animals: being possessed of little strength or agility, he does not attempt to fly from or assail his enemies; but erects his bristles, and rolls himself up like a ball, exposing no part of his body that is not furnished with sharp weapons of defence; he will not unfold himself, unless thrown into water: the more he is frightened or harassed, the closer he shuts himself up; and frequently discharges his urine, which has a very fetid and loathsome smell. While in this state, most dogs, instead of biting him, stand off and bark, not daring to seize him; or, if they attempt it once, their mouths are so prickled with his bristles, that they cannot be prevailed upon to attempt it a second time. Both the male and female are covered with bristles from the head to the tail. These bristles are of great use in defending them from other animals; but must be very inconvenient when they incline to copulate. This operation they cannot perform in the manner of other quadrupeds; but do it face to face, either standing on end, or the female lying on her back. The females come in season in the spring, and bring forth their young in the beginning of summer. They commonly bring forth three or four, and sometimes five at a time. The young ones are of a whitish colour, and only the points of the bristles appear above the skin. It is impossible to tame them: the mother and her young have frequently been confined together, and furnished with plenty of provisions; but, instead of nourishing them, she uniformly devoured them one after another. Males and females have likewise been kept in one apartment, where they lived, but never copulated. Hedge-hogs feed upon fallen fruits, some roots, and insects: they are very fond of flesh-meat, whether raw or roasted. They frequent woods, and live under the trunks of old trees, in the chinks of rocks, or under large stones. Naturalists allege, that they go into gardens, mount the trees, and come down with pears, apples, or plums, stuck upon their bristles. But this is a mistake: although kept in a garden, they never attempt to climb trees, or stick even fallen fruit upon their bristles, but lay hold of their food with their mouth. They never come out of their holes in the day, but go about in quest of food during the night. They eat but little, and can live very long without taking any nourishment. They do not lay up any store of provisions in harvest; such an instinct would be useless, as they sleep all the winter. They lie under the undeserved reproach of sucking cattle and hurting their udders; but the smallness of their mouth renders that impossible. There are three species, viz.

1. The europæus, or common hedgehog, with round ears, and crested nostrils. It is about nine inches long; the upper part of the body is totally covered with sharp prickles, and the under part is covered with hair. The hedgehog, even when standing on his

Eringo
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Erivan.

his legs, has a very ugly aspect. His body is an oblong mass, convex above, terminated on the fore-part by a very sharp muzzle, and mounted on four short legs, of which nothing appears but the feet, and the tail is not discernible. His ears are broad, round, and short; and his eyes are small and protuberant. The length of his body, from the point of the muzzle to the anus is about nine inches.—2. The inauris, or white hedge-hog, has no external ears. It is a native of America. 3. The malaccensis has hanging ears, and is a native of Asia.

ERINGO, in botany. See ERYNGIUM.

ERINUS, in botany: A genus of the angiospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 40th order, *Personata*. The calyx is pentaphyllous; the limb of the corolla quinquefid and equal; with its lobes emarginated, and the upper lip very short and reflexed; the capsule bilocular. There are six species, none of them natives of Britain. They grow from two inches to four feet in height, and are adorned with flowers of a white or purple colour. They are propagated by seeds, but in this country generally require to be kept in a stove.

ERIOCAULON, in botany: A genus of the trigynia order, belonging to the triandria class of plants; and in the natural method ranking with the sixth order, *Ensata*. The common calyx is an imbricated capitulum or knob; there are three equal petals; and the stamina are on the germen.

ERIOCEPHALUS, in botany: A genus of the polygamia necessaria order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Composita*. The receptacle is somewhat villous; there is no pappus; the calyx is decaphyllous and equal; the radius has five florets.

ERIOPHORUM, in botany: A genus of the monogynia order, belonging to the triandria class of plants; and in the natural method ranking under the third order, *Calamaria*. The glumes are paleaceous and imbricated all round; there is no corolla; and only one seed furnished with a very long down.

ERITHALIS, in botany: A genus of the monogynia order, belonging to the pentandria class of plants; and in the natural method ranking with those of which the order is doubtful. The corolla is quinquepartite; the calyx urceolated or bladder-like, the berry decemlocular inferior.

ERIVAN, a city of Persia, in Asia, and capital of Persian Armenia. It is a large, dirty, ill-looking place, in which are no handsome buildings, the houses being very mean, and raised with earth or mud; but it is full of gardens or vineyards. It is situated in a plain which is surrounded on all sides with mountains. Two rivers pass near it, the Zengui to the north-west, and the Queur Boulac to the south-west. The fortress may pass for a town of itself; it is of an oval form, and is four miles in circumference, containing about 800 houses. It is inhabited by none but the native Persians. The Armenians have shops in it, where they work and trade in the day-time, but at night return to their habitations in the city. The fortress is surrounded with three walls, made with bricks dried in the sun, which have battlements, and are flanked with towers, and defended with ramparts. On the north-

east there is a dreadful precipice, above 200 yards in depth, at the bottom of which the river runs. The garrison usually consisted of 2000 men; but how many there are since the revolution, is hard to say. The palace of the governor of the province is within the fortress. The city is about a cannon's shot distant from the fortress, and the space between is full of houses and markets. E. Long 44. 50. N. Lat. 40. 20.

ERIPHYLE (fab. hist.), a sister of Adrastus king of Argos, who married Amphiaraus. She was daughter of Talaus and Lirimache. When her husband concealed himself that he might not accompany the Argives in their expedition against Thebes, where he knew he was to perish, Eriphyle suffered herself to be bribed by Polynices with a golden necklace which had been formerly given to Hermione by the goddess Venus, and she discovered where Amphiaraus was. This treachery of Eriphyle compelled him to go to the war; but before he departed, he charged his son Alcmaeon to murder his mother as soon as he was informed of his death. Amphiaraus perished in the expedition; and his death was no sooner known than his last injunctions were obeyed, and Eriphyle was murdered by the hands of her son.

ERIS, the goddess of discord among the Greeks. She is the same as the *Discordia* of the Latins.

ERISICHTHON (fab. hist.), a Thessalian, son of Triops, who derided Ceres and cut down her groves. This impiety irritated the goddesses, who afflicted him with continual hunger. He squandered all his possessions to gratify the cravings of his appetite, and at last he devoured his own limbs for want of food. Some say that his daughter had the power of transforming herself into whatever animal she pleased, and that she made use of that artifice to maintain her father, who sold her, after which she assumed another shape, and became again his property.

ERMIN, in zoology. See MUSTELA.

ERMIN, or *Ermine*, in heraldry, denotes a white field or fur, powdered or interspersed with black spots, called *powdering*. It is supposed to represent the skin of an animal of the same denomination (see MUSTELA). There is however no animal whose skin naturally corresponds to the herald's ermin.

The animal is milk white; and so far is it from having spots, that tradition reports, that it will rather die or be taken than fully its whiteness. Whence its symbolical use.

But white skins having for many ages been used for the linings of the robes of magistrates and great men; the furriers at length, to add to their beauty, used to sew bits of the black tails of those creatures upon the white skins, to render them the more conspicuous. Which alteration was introduced into armoury.

The sable spots in ermin are not of any determinate number, but they may be more or less at the pleasure of the painter or furrier.

ERMIN, an order of knights, instituted in 1450 by Francis I. duke of Bretagne, and formerly subsisting in France. The collar of this order was of gold, composed of ears of corn in saltier; at the end of which hung the ermin, with this inscription, *a ma vie*. But the order expired when the dukedom of Bretagne was annexed to the crown of France.

Eriphyle
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Ermin.

Ermines

Ermines.

ERMINES, in heraldry, the reverse of ermine, i. e. white spots on a black field.

ERMINITES, in heraldry, should signify little ermines, but it is otherwise; for it signifies a white field powdered with black, only that every such spot hath a little red hair on each.—Erminites also signify a yellow field powdered with black, which the French express much better by *or semé d'ermine de sable*.

ERMINOIS, in heraldry, signifies the field or, and the spots black.

EROORO, in ornithology. See *ALCEDO*, of which it is a species.

EROS (of *eros* "love"), in mythology, one of two chiefs over all the other Cupids, being the cause of love. See *ANTEROS*.

EROTIA, a festival in honour of Eros the god of love. It was celebrated by the Thespians every fifth year with sports and games, when musicians and others contended. If any quarrels or seditions had arisen among the people, it was then usual to offer sacrifices and prayers to the god, that he would totally remove them.

EROTIC (derived from *eros* "love;" whence *erotikos*), is applied to any thing which has a relation to the passion of love.

In medicine we find the phrase *delirium eroticum* used for a kind of melancholy contracted through excess of love.

EROSION, among physicians, denotes much the same with *CORROSION*, only in a stronger degree.

EROTESIS. See *ORATORY*, n° 94.

ERPENIUS (Thomas), in Dutch *THOMAS* of *ERPE*; a celebrated professor of the Arabic language, was born at Gorcum in Holland, in 1584, and educated at Leyden. He applied himself to the oriental languages at the persuasion of Joseph Scaliger; and afterwards travelled into England, France, Italy, and Germany, and every where obtained the esteem of the learned. On his return to Holland, he was made professor of Arabic in the university of Leyden, and died there in 1624. He published a great many excellent works, which spread his reputation through the whole learned world. It is said, that the king of Morocco admired so greatly the letters Erpenius wrote to him in Arabic in the name of the United Provinces, that he could not cease reading them, and showing them to those who spoke that language naturally.

ERRATIC, in general, something that wanders, or is not regular: hence it is the planets are called *erratic stars*.

ERRHINES, in pharmacy, medicines which when snuffed up the nose promote a discharge of mucus from that part.

Among the milder kinds of the errhines we may reckon marjoram, basilicon, thyme, hyssop, savory, marum syriacum, the tops of origanum, flowers of lilies of the valley, and gum benzoin, the resin of guaiacum, fine raspings of aloes wood, dry volatile salt of sal ammoniac perfumed with oil of marjoram, as also white vitriol. On the contrary, violent errhines are, euphorbium, the powder of white hellebore, and, in a milder degree, several sorts of snuffs, precipitate mercury, and pepper.

Errhines are more friendly to the constitution and

nerves than sternutatories, by their subtle, acrid, and volatile salt gently stimulating the pituitary membrane, and drawing the mucid humour from it. They are also much safer than sternutatories in their effects.

Errhines prepared of cephalic herbs are of singular service in oppressive pains of the head, a hermicrania, lethargic disorders, weaknesses of memory, stuffings of the head, and coryza, mucous defluxions of the eyes, drowsiness, vertigoes, and in cases where the malignant humours generated by the lues venerea are lodged in the membranes of the nostrils.

ERROR, in philosophy, a mistake of our judgment, giving assent to that which is not true.

Mr Locke reduces the causes of error to these four; first, want of proofs; secondly, want of ability to use them; thirdly, want of will to use them; and, fourthly, wrong measures of probability.

He observes upon the first of these causes of error, that the greatest part of mankind want conveniences and opportunities of making experiments and observations themselves, or of collecting the testimony of others, being prevented by the necessity of their condition. Upon the second of these causes, he observes, that there are many, who, from the state of their condition, might bestow time in collecting proofs, but yet are not able to carry a train of consequences in their heads, nor weigh exactly the preponderancy of contrary proofs and testimonies, merely from the difference in mens understandings, apprehensions, and reasonings. Thirdly, he remarks, that though some have opportunities and leisure enough, and want neither parts, learning, nor other helps, that they never come to the knowledge of several truths within their reach, either upon account of their attachment to pleasure or business; or otherwise because of their laziness or aversion to study. The fourth cause of error, viz. wrong measures of probability, he imputes, 1. To the practice of taking for principles propositions that are not in themselves certain and evident, but, on the contrary, doubtful and false. 2. To received hypotheses. 3. To predominant passions or inclinations. And, 4. To authority, or the giving up our assent to the common received opinions either of our friends or party, neighbours or country.

The causes of error in philosophy, or the reasons why all former philosophers have through so many ages erred, according to Lord Bacon, are these following. 1. Want of time suited to learning. 2. The little labour bestowed upon natural philosophy. 3. Few entirely addicted to natural philosophy. 4. The end of the sciences wrong fixed. 5. A wrong way chosen. 6. The neglect of experiments. 7. Regard to antiquity and authority. 8. Admiration of the works in use. 9. The artifice of teachers and writers in the sciences. 10. Ostentatious promises of the moderns. 11. Want of proposing worthy tasks. 12. Superstition and zeal being opposite to natural philosophy, as thinking philosophy dangerous, on account of the school-theology; from the opinion that deep natural inquiries should subvert religion. 13. Schools and academies proving unfavourable to philosophy. 14. Want of rewards. And, 15. Despair, and the supposition of impossibility.

ERROR Loci. Boerhaave is said to have introduced the term, from the opinion that the vessels were of dif-

Error.

Eruca. different sizes for the circulation of blood, serum, and lymph; and that when the larger-sized globules were forced into the lesser vessels by an error of place, they were obstructed. But this opinion does not seem well grounded.

ERUCA, in general, denotes caterpillars of all kinds.

The caterpillar state is that through which every butterfly must pass before it arrives at its perfection and beauty: and, in the same manner, all the known winged animals, except only the puceron, pass through a reptile state; none of them, except this, being produced in their winged form. The change from caterpillar to butterfly was long esteemed a sort of metamorphosis; a real change of one animal into another: but this is by no means the case. The egg of a butterfly produces a butterfly, with all lineaments of its parent; only these are not disclosed at first, but for the greater part of the animal's life they are covered with a sort of case or muscular coat, in which are legs for walking, which only suit it in this state; but its mouth takes in nourishment, which is conveyed to the included animal; and after a proper time this covering is thrown off, and the butterfly, which all the while might be discovered in it by an accurate observer with the help of a microscope, appears in its proper form. Before it passes into this state, however, there requires a state of rest for the wings to harden, and the several other parts to acquire their proper firmness; this is transacted in a time of perfect rest, when the animal lies in what is called the *nymph* or *chrysalis* state, in appearance only a lump of inanimate matter. There is a settled and determined time for each of these changes in every species; but, in the several different kinds, the periods are very different.

There is no sign of sex in the animal while in the caterpillar state: the propagation of the species is the business of the creature in its ultimate perfection; and till that, these parts are never excluded: one female butterfly, when she has been impregnated by the male, will produce 300 or 400 eggs, or even more.

There is no way of knowing the sexes of these little creatures by viewing the parts; but the whole figure and manner of the animal makes the difference. The females are always larger than the males; they are also more slow in their motions; and some of them have no wings, or, at the most, only very small ones. The males, however, have a sort of beards, more beautiful than the antennæ or horns of the females: the female is much stronger as well as bigger than the male; and not unfrequently, in case of danger or disturbance, she flies away with him in time of copulation.

On dissecting the female, her uterus affords an astonishing sight. The number of eggs in the tubes is amazing: but these have not all the same figure; and, in some species, as the silk-worm, &c. the eggs are of a beautiful blue; if any yellowish ones are seen among them, they are judged to be defective.

The care of all the butterfly tribe to lodge their eggs in safety is surprising. Those whose eggs are to be hatched in a few weeks, and who are to live in the caterpillar state during part of the remaining summer, always lay them on the leaves of such plants as will afford a proper nourishment; but, on the contrary, those whose eggs are to remain unhatched till the following spring, always lay them on the branches of

trees and shrubs, and usually are careful to select such places as are least exposed to the rigour of the ensuing season, and frequently cover them from it in an artful manner. Some make a general coat of a hairy matter over them, taking the hairs from their own bodies for that purpose; others hide themselves in hollow places in trees, and in other sheltered cells, and there live in a kind of torpid state during the whole winter, that they may deposit their eggs in the succeeding spring, at a time when there will be no severities of weather for them to combat. The day-butterflies only do this, and of these but a very few species; but the night ones, or phalænæ, all without exception, lay their eggs as soon as they have been in copulation with the male, and die immediately afterwards.

It is well known, that the common and natural food of these creatures is the leaves and verdure of vegetables; yet, as weak and harmless as they seem, they will many of them destroy their fellows whenever they get an opportunity. M. Reamur gives us an instance of this in 20 caterpillars of the oak, which he kept in a box with a sufficient quantity of their natural food: yet their numbers daily decreased, till at last there remained only one. This is, however, only the case in some few species, the generality of these animals being very peaceable, many species living together in the same place without molesting one another. These species, however, though freed from such dangers, are exposed to others of a much more terrible kind; the worms or maggots of several sorts of flies are frequently found about them, some preying upon their outside, others lodged within them under the skin, but both kinds eating the poor defenceless creature up alive. Those which feed on the outides are easily discovered, the others are more hid; and frequently the caterpillar, which seems very hearty and vigorous, and very fleshy, shall be found, upon opening, to be a mere skin, the internal parts being found to be all eaten away, and all the food that he swallows serving only to feed a vast number of worms, or maggots, which crawl about at liberty within him. These devouring worms are of many different species; some being of the gregarious, some of the solitary kinds, and some spinning webs of their own silk to transform themselves in; others undergoing that change without any such covering. The beautiful cabbage-caterpillar is one of those unhappy kinds which frequently are infested with the gregarious kinds, large numbers of which spin themselves webs one after another, and afterwards come out in the shape of the parent-fly to whose eggs they owed their origin.

These intestine enemies are a sure prevention of the butterfly's appearing at its proper time; and as many of the former naturalists, who knew what butterfly to expect from a peculiar species of caterpillar which they preserved, often saw a parcel of flies come out in the place of it, they having no idea that the fly had laid its eggs in the flesh of the poor creature, supposed that this was one of its natural transformations, and that certain species of caterpillars sometimes produced butterflies, sometimes small flies.

These, and many other destroyers, among which the birds are to be reckoned in the principal place, serve a noble purpose in preventing the too great number of these mischievous animals. Their usual habitation

Eruca.

tion being the leaves and flowers of plants, they are, in their feeding, much exposed to all those destroyers: yet nature has taken care to preserve a great number, by making many of them so exactly of the colour of the leaves they feed on, that they are not easily distinguished from them; and by giving others a caution of keeping on the under part of the leaves, and being by that means out of sight. But some species are much less exposed, and of much more mischief to the plants they feed on, by devouring more essential parts of them. Of these some eat the roots, and others the interior part of the trunk, destroying the vessels that imbibe, and those that distribute the juices. These are different from the common caterpillars, in that their skin is much less rough and hard; and these are secure from our observation, and in general from their great destroyers the birds. They are not, however, absolutely safe from the common dangers of the other species; for there is a kind of worms that find their food and habitation even in the bodies of these.

The root-caterpillars, and those which live within the branches of plants, are much more easily found out. The roots of *Scrophularia*, and the stalks of lettuces, and some other plants, afford caterpillars which seem all of the same species. Those found in the lettuces are extremely plentiful some years, and destroy vast quantities of that plant. These usually have their first habitation in the stalk, near the root.

Nothing more surprises us, in regard to insects, than their industry; and in this the caterpillars yield to no kind, not to mention their silk, the spinning of which is one great proof of it. The sheaths and cases which some of these insects build for the passing their transformations under, are, by some, made of the silk, with their own hair, mixed with pieces of bark, leaves, and other parts of trees, with paper, and other materials; and the structure of these is well worthy our attention.

There are others whose workmanship, in this article, far exceeds these. There is one which builds in wood, and is able to give its case a hardness greater than that of the wood itself in its natural state. This is the strange horned caterpillar of the willow, which is one of those that eat their *exuvie*. This creature has extremely sharp teeth, and with these it cuts the wood into a number of small fragments: these fragments it afterwards unites together into a case, of what shape it pleases, by means of a peculiar silk; which is no other than a tough and viscous juice, which hardens as it dries, and is a strong and firm cement. The solidity of the case being thus provided for, we are to consider, that the caterpillar inclosed in it is to become a butterfly; and the wonder is, in what manner a creature of this helpless kind, which has neither legs to dig nor teeth to gnaw with, is to make its way out of so firm and strong a lodgment as this is in which it is hatched. It has been supposed by some, that the butterfly, as soon as hatched, discharged a liquor which softened the viscous matter that holds the case together, and so its several fragments falling to pieces, the way out lies open. This is evidently the truth of the case; though those who supposed it, did it by mere conjecture: for, on a strict examination, this liquor is always to be found in the animal, and is of the most proper kind for such a service. Reaumur judged, from the effects, that this li-

quor must be of a singular nature, and very different from the generality of animal fluids: and in dissecting this creature in the caterpillar state, there will always be found near the mouth, and under the *œsophagus*, a bladder of the bigness of a small pea, full of a limpid liquor, of a very quick and penetrating smell, and which, upon divers trials, proves to be a very powerful acid; and among other properties, which it has in common with other acids, it sensibly softens the glue of the case, on a common application.

It is evident that this liquor, besides its use to the caterpillar, remains with it in the chrysalis state, and is the very thing that gives it a power of dissolving the structure of the case, and making its way through in a proper manner at the necessary time. Dr Boerhaave has adopted the opinion, that there are no true acids in animals, except in the stomach or intestines; but this familiar instance proves the error of that determination. *Phil. Trans. abr. ix. p. 39, &c.*

Another very curious and mysterious artifice, is that by which some species of caterpillars, when the time of their changing into the chrysalis state is coming on, make themselves lodgments in the leaves of the trees, by rolling them up in such a manner as to make themselves a sort of hollow cylindric case, proportioned to the thickness of their body, well defended against the injuries of the air, and carefully secured for their state of tranquillity.

Besides these caterpillars, which in this manner roll up the leaves of plants, there are other species which only bend them once; and others which, by means of thin threads, connect many leaves together to make them a case. All this is a very surprising work, but all much inferior to this method of rolling.

The different species of caterpillars have different inclinations, not only in their spinning and their choice of food, but even in their manners and behaviour one to another. Some never part company from the time of their being hatched to their last change; but live and feed together, and undergo together their last change into the chrysalis state. Others separate one from another as soon as able to crawl about, and each hunts its fortune single; and there are others which regularly live to a certain time of their lives in community, and then separate each to shift for itself, and never to meet again in that state. *Reaumur, Hist. Insect. vol. ii. passim.*

Caterpillars are very destructive and pernicious in gardens, particularly those of two species. The one of these is that which afterwards becomes the common white butterfly. This is of a yellowish colour, spotted with black; and infests the leaves of cabbages, cauliflowers, and the Indian cress, of which it eats off all the tender parts, leaving only the fibres entire; so that whole plantations are often seen destroyed by them in autumn, especially such as are near large buildings, or are crowded with trees. There is no remedy against this evil but the pulling the creatures off before they are spread from their nests, and watching the butterflies, which are daily, in the hot weather, depositing their eggs on these plants. These, however, feed principally on the outside of the leaves of the plants, and are therefore the easier taken off; but the other kind lies near the centre, and therefore is with much more difficulty discovered. This is much larger; and the skin

Eruca.

Eruca.

skin is very tough, and of a brown colour. It is called by the gardeners a *grub*, and is extremely pernicious. The eggs which produce it are usually deposited in the very heart or centre of the plant, particularly in cabbages; and the creature, when formed, and grown to some size, eats its way through all the blades, and leaves its dung in great quantity behind it, which spoils the cabbage. This insect also burrows under the surface of the ground, and makes sad havoc among young plants, by eating off their tender stalks, and drawing them into its holes. This mischief is chiefly done in the night; but wherever a plant is seen thus destroyed, if the earth be stirred with a finger an inch deep, the creature will be certainly found, and this is the only way of destroying them. *Miller.*

When these animals attack fruit-trees, the best method of driving them off is to boil together a quantity of rue, wormwood, and the common tobacco, of each equal parts, in common water; to make the liquor very strong, and sprinkle it on the leaves and young branches every night and morning, during the time when the fruit is ripening. See also the article *CATERPILLAR*.

In Dr Hawkesworth's Account of the Voyages to the South Sea, vol. iii. p. 520. we have the following account of a kind of small green caterpillar, which the voyagers found in great numbers on the true West Indian mangroves. Their bodies were thick set with hairs, and they were ranging on the leaves side by side like files of soldiers, to the number of 20 or 30 together. When they touched them, they found that the hairs on their bodies had the quality of a nettle, and gave them a much more acute though less durable pain.

ERUCÆ Aquaticæ, Water Caterpillars. It may seem incredible, that there is any such thing as a caterpillar whose habitation is under water; but experience and observation prove, that there are such, and that they feed on the water-plants as regularly as the common kinds do on those at land. These are not named at random like many of the aquatic animals of the larger kinds, as the sea-wolf, the sea-horse, &c. which might as well be called any thing else as *wolves* and *horses*; but they are properly what they are called, and do not respire in the manner of the fish-tribe, but by their stigmata as other caterpillars. M. Reaumur, in his observations, met with two species of these; the one upon the potamogeton or pond-weed, the other upon the lenticula or duck-meal. These are both very industrious animals; but the first being much the largest, its operations are more easily distinguished.

This, though truly an aquatic animal, swims but badly, and does not at all love to wet itself. The parent butterfly lays her egg on the leaf of a certain plant; and as soon as the young caterpillar is hatched, it gnaws out a piece of the leaf, of a roundish shape. This it carries to another part of the same leaf, and lays it in such a manner, that there may be a hollow between, in which it may lodge. It then fastens down this piece to the larger leaf with silk of its own spinning; only leaving certain holes at which it can put out its head, and get to gnaw any of the leaves that are near. It easily gets out, though the aperture be

Nº 118.

naturally small, since a little force from its body bends up the upper leaf and down the lower, both being flexible; and when the creature is out, it has a sort of down that defends it from being wetted, and the natural elasticity of the leaves and of the silk joins the aperture up again, so that no water can get in. The leaves of this kind of plant are also naturally very slippery, and not easily wetted by water. It soon happens that this habitation becomes too small for the animal, in which case it makes just such another; and after that, at times, several others; each being only made fit for it at the size it is then of. The changes of this creature into the chrysalis and butterfly states are in the common method. The butterfly gets out of a chrysalis which was placed on the surface of the water; the lightness of the animal easily sustains it on the water till its wings are dried, and then it leaves that element, never to return to it again.

ERUCÆ Sylvestris, Wood-caterpillars; the name of a sort of caterpillars which do not live, after the manner of others, on leaves of trees or plants, or open to our observation; but under the bark, in the trunk and branches, and in the roots of trees, and sometimes in the body of fruits.

These are easily distinguished from those worms and maggots which are found in roots and fruits, and owe their origin to flies of another kind; but are liable to be confounded with a sort of animals, called by M. Reaumur, *false* or *bastard caterpillars*, which carry a great resemblance in their figure to real caterpillars, but which have more legs than any of the true ones have, and are finally transformed into four-winged flies, which are not true butterflies.

The butterflies which are the parents of those caterpillars that lie immured in trees or fruits, lay their eggs on the surface; and the young caterpillars, when hatched, eat their way in. What appears something surprising, however, in this, is, that there usually is only one caterpillar in a fruit which is large enough to afford food to a great number; and if there are sometimes found two creatures within, one is usually a caterpillar, the other a worm of some other kind. The whole occasion of which is, that the operation of penetrating into the fruit is so difficult to the young animal, that it seldom succeeds in it; and tho' the butterfly deposits many eggs on each fruit, and these all hatch, yet it is only here and there one on a fruit that can find the way into it.

These creatures, when once lodged in their prison, have nothing to do but to eat up the substances which inclose them, leaving the outer hard shell unhurt, which still serves as a case for them. This is a very frequent case in the grains of corns, where the farinaceous substance serves as aliment, and the hard outer skin becomes a firm hollow case afterwards for the animal. The farinaceous substance in this case usually proves enough for the animal in its caterpillar state; but if it does not, the creature has recourse to a very singular expedient: it eats again its own excrements; and finds its now stronger stomach able to separate nourishment from that very matter which had before passed off from its weaker stomach undigested.

Of these species of caterpillars, some go out of their prison in order to change into their chrysalis, and thence into their butterfly state; but the greater number

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Erudition
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Ervum.

ber remain there, and pass through all their changes within. These caterpillars, like all the other kinds, have certain flesh-eating worms, whose parents are of the fly-kind, for their terrible enemies and destroyers; and it is not unfrequent, on opening one of these spoiled fruits, instead of the expected caterpillar, to find a fly just ready to come out: this has been produced from the chrysalis of a worm, which had before found its way into the fruit, and eat up the caterpillar, which was the original possessor of the place.

ERUDITION, denotes learning or knowledge; and chiefly that of history and antiquity, of languages and of books, which is the result of hard study and extensive reading. The Scaligers were men of deep erudition: the writings of M. Launoy, a priest of the Oratory, are full of erudition.

Mr Locke says, it is of more use to fill the head with reflections than with points of erudition. If the mind be not just and right, ignorance is better than erudition, which only produces confusion and obscurity. M. Balzac calls a heap of ill chosen erudition the luggage of antiquity.

ERUPTION, in medicine, a sudden and copious excretion of humours, as pus or blood: it signifies also the same with exanthema, any breaking out, as the pustules of the plague, small-pox, measles, &c.

ERUPTION of *Volcanoes*. See *ÆTNA*, *ETNA*, *VE-SUVIUS*, *VOLCANO*, &c.

ERVUM, the *LENTIL*: A genus of the decandria order, belonging to the diadelphia class of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The calyx is quinquepartite, the length of the corolla. There are six species; of which the most remarkable is the lens, or common lentil. It is cultivated in many parts of England, either as fodder for cattle, or for the seeds which are frequently used in meagre soups. It is an annual plant, and rises with weak stalks about 18 inches high, garnished with winged leaves composed of several pairs of narrow lobes, terminated by a clasper or tendril, which fastens to any neighbouring plant, and is thereby supported: the flowers come out three or four together, upon short footstalks from the side of the branches. They are small, of a pale purple colour, and are succeeded by short flat pods, containing two or three seeds which are flat, round, and a little convex in the middle. The seeds of this plant are most commonly sown in the month of March, where the land is dry; but in moist ground, the best time is April. The usual quantity of seed allowed for an acre of land is from one bushel and a half to two bushels. If these are sown in drills in the same manner as pease, they will succeed better than when sown in broadcast: the drills should be a foot and a half asunder, to allow room for the Dutch hoe to clean the ground between them; for if the weeds are permitted to grow among them, they will get above the lentils and starve them.

There is another sort of lentil also cultivated in this country under the name of *French lentil*. It is twice the size of the former, both in plant and seed; and is much better worth cultivation than the other. It should be sown in March, after a single ploughing, in the ground that bore corn the year before. Manure is not absolutely necessary, though it will undoubtedly

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increase the crop. Its grass is said to be very copious; it may be mowed many times in the year, and affords a healthy as well as an agreeable food to horses, cows, and sheep: the milk of cows fed with it is said to be very copious and good. Long and numerous pods ripen about the beginning of winter, which afford a new kind of legumen, to be eaten as common lentils: when fresh, it makes admirable pease-soup; dry, it is greedily eaten by the poultry. The dried herb is also a good resource for cattle in winter. It grows on any kind of ground.

ERYMANTHUS, a mountain, river, and town of Arcadia, where Hercules killed a prodigious boar, which he carried on his shoulders to Eurytheus; who was so terrified at the sight, that he hid himself in a brazen vessel.

ERYNGIUM, SEA-HOLLY, or *Eryngo*: A genus of the digynia order, belonging to the pentandria class of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The flowers are collected into a round head, and the receptacle is paleaceous. There are nine species; most of which are hardy herbaceous perennials, producing erect stalks from one to two or three feet high; with simple, entire, or divided prickly leaves; and the stalks terminated by roundish aggregate heads of quinquepetalous flowers, of white, blue, or purple colours. They all flower mostly in July, and the seeds ripen in September. They are propagated by seeds sown in a bed or border, either in spring or autumn. The plants are to be removed the autumn after they come up, into those places where they are designed to remain. The leaves of one of the species (viz. the maritimum, which grows naturally on the sea-coasts of England and Scotland) are sweetish, with a light aromatic warmth and pungency. The roots are accounted aphrodisiac, and are ordered to be kept candied in the shops. The young flowering shoots eaten like asparagus are very grateful and nourishing.

ERYSIMUM, HEDGE-MUSTARD: A genus of the filiquosa order, belonging to the tetradynamia class of plants; and in the natural method ranking under the 39th order, *Siliquosæ*. The siliqua is long, linear, and exactly tetragonal; the calyx close. There are six species; of which the most remarkable is the officinale, hedge-mustard, or bank-creffes. It grows naturally in Britain under walls, by the sides of highways, and among rubbish. It is warm and acrid to the taste; and when cultivated, is used as a vernal pot-herb. Birds are fond of the seeds; sheep and goats eat the herb; cows, horses, and swine refuse it. The seeds are said to promote expectoration, excite urine and the other fluid secretions, and to attenuate and dissolve viscid juices, &c. This they are supposed to perform by an acrimonious stimulating quality; but the taste discovers in them only an herbaceous softness void of acrimony: the seeds indeed are considerably pungent, and the roots in some small degree.

ERYSIPELAS, in medicine, an eruption of a fiery or acrid humour, from which no part of the body is exempted, though it chiefly attacks the face. See *MEDICINE-Index*.

ERYTHEA, or ERYTHIA, an island adjoining, according to the ancients, either to or a part of Gades; no where now to be found by the description given of

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Erynthea.

Erythræ
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Erythro-
nium.

it by ancient authors. The poets feign this to be the habitation of the fabulous Geryon, disarmed by Hercules, who drove away his cattle.

ERYTHRÆ (anc. geog.), a port town of Ætolia, on the Corinthian bay. Another Erythræ of Bœotia, near Platæa and mount Cithæron. A third Erythræ, a town of Ionia in the Hither Asia, situated in the peninsula, at its extremity, with a cognominal port. The Erythreans laid claim to the Sibyl Herophile, as their country-woman, furnished thence *Erythraea*. Erythræ was famous for an ancient temple of Hercules.

ERYTHRÆA, a town of Crete, situated in the south-east of the island, at the promontory Erythræum.

ERYTHRÆUM MARE, erroneously called *Rubrum* by the Romans. Thus the ocean that washes Arabia and Persia, and extends a great way farther, is denominated. Hence it is, Herodotus says, that the Euphrates and Tigris fall into the Mare Erythræum. He also calls it the *South Sea*, on which the Persians dwell. It takes its name, not from its colour, the error of the Romans, who translated *Erythræum*, "*Rubrum*;" but from *Erythras*, son of Perseus and Andromeda, whose kingdom lay on the confines of that sea; whence its name *Erythræum*.

ERYTHRINA, CORAL-TREE: A genus of the decandria order, belonging to the diadelphia class of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The calyx is bilabiate, the one lip above, the other below; the vexillum of the corolla is very long and lanceolated. There are four species, all of them shrubby flowering exotics for the stove, adorned chiefly with trifoliate or three-lobed leaves, and scarlet spikes of papilionaceous flowers. They are all natives of the warm parts of Africa and America; and must always be kept in pots, which are to remain constantly in stoves in this country. They are propagated by seeds, which are annually imported hither from Africa and America. They are to be sown half an inch deep in pots of light rich earth, which are then to be plunged in the bark-bed of the stove; and when the plants are two inches high, they are to be separated into small pots, plunging them also in the bark-bed, giving them frequent waterings, and as they increase in growth shifting them into larger pots. The inhabitants of Malabar make sheaths of the wood, for swords and knives. They use the same, together with the bark, in washing a sort of garments which they call *farassas*; and make of the flowers the confection *caryl*. The leaves pulverised and boiled with the mature cocoa-nut, consume venereal buboes, and ease pains in the bones; bruised and applied to the temples, they cure the cephalæa and ulcers: mixed with the sugar called *jagra*, they mitigate pains in the belly, especially in women; and the same effect follows from the use of the bark levigated with vinegar, or swallowing the kernel stripped of its red pellicle. The juice of the leaves taken with oil mitigates venereal pains; drank with an infusion of rice, it stops fluxes; made into a cataplasm with the leaves of betel, it destroys worms in old ulcers; and worked with oil, it cures the psora and itch.

ERYTHRINUS, in ichthyology, a species of SPARUS.

ERYTHROIDES, in anatomy, the first of the proper tunics or coats which cover the testicles.

ERYTHRONIUM, DOG'S-TOOTH VIOLET: A ge-

nus of the monogynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. The corolla is hexapetalous and campanulated; with a nectarium of two tubercles adhering to the inner base of every other petal. There is only one species, which, however, admits of several varieties in its flowers, as white, purple, pale red, dark red, crimson, and yellow. The plants are low and herbaceous, with a purple stalk and hexapetalous flowers. All the varieties are hardy and durable; and may be planted in small patches in borders, where they will make a good appearance. They rarely perfect their seeds in this country, but may be propagated by offsets. In Siberia, according to Gmelin, they dry and mix the root of this plant with their soups. It grows there in great abundance; and is called by the people of the country *befs*.

ERYTHROXYLON, in botany: A genus of the trigynia order, belonging to the decandria class of plants; and in the natural method ranking with those the order of which is doubtful. The calyx is turbinate; the petals of the corolla have each a nectariferous emarginated scale at the base; the stamina are connected at the base; the fruit a bilocular plum.

ERYX, a son of Butes and Venus, who relying upon his strength, challenged all strangers to fight with him in the combat of the cestus. Hercules accepted his challenge after many had yielded to his superior dexterity; and Eryx was killed in the combat, and buried on the mountain, where he had built a temple to Venus. Virg. *Æn.* 5. v. 402. A mountain of Sicily near Drepanum, which received its name from Eryx, who was buried there. This mountain was so steep, that the houses which were built upon it seemed every moment ready to fall. Dædalus had enlarged the top, and inclosed it with a strong wall. He also consecrated there to Venus Erycina a golden heifer, which resembled life so much, that it seemed to exceed the power of art.

ERZERUM, or ERZERON, a city of Turkey in Asia, and capital of Armenia, or Turkomania. It is a pretty large town, five days journey from the Black Sea, and ten from the frontiers of Persia. It stands in a delightful plain, at the foot of a chain of mountains, which hinder the Fræt, or Euphrates, from falling into the Black Sea. A neighbouring hill supplies very fine springs, which not only water the fields, but the streets of the town. Erzerum is surrounded with double walls, defended by pentagonal towers; but the ditches are neither deep nor well kept up. The beglerbeg, or bashaw of the province, lives in the seraglio, which is very ill built. They reckon that there are 18,000 Turks at Erzerum, 6000 Armenians, and 10,000 Greeks. The Armenians have a bishop and two churches; and the Greeks have also a bishop, but the church is a miserable place. The last are mostly braziers, inhabiting the suburbs, who work the copper brought from the neighbouring mountains. They drive a great trade in copper utensils and furs, particularly martins skins. Five or six days journey from the town there are oaks that produce plenty of gall-nuts, which are brought hither. This place is the thoroughfare and resting place of all the merchants trading to the Indies, especially when the Arabs are watching for their prey round Aleppo and Bagdad. E. Long. 40. 50. N. Lat. 29. 46.

ESAR.

Efarhaddon
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Eschara.

ESARHADDON, the son of Sennacherib, and his successor in the kingdom of Assyria. He is said to have reigned 29 years at Nineveh, from the year 3294 to 3322; besides which he reigned 13 years at Babylon, in all 42 years. He died in the year of the world 3336, and was succeeded by Saosduchinus. Efarhaddon, in the opinion of Sir Isaac Newton, seems to be the Sardanapalus who died, as Clectarchus says, of old age, after the revolt of Syria; the name *Sardanapalus* being derived from *Afferbadon Pul*.

ESCALADE, or **SCALADE**, a furious attack of a wall or a rampart; carried on with ladders, to pass the ditch or mount the rampart; without proceeding in form, breaking ground, or carrying on regular works to secure the men.

When the troops are prepared to pass the ditch, either with the assistance of boards, hurdles, and fascines, when it is muddy, or with small boats of tin, or baskets covered with skins or oil-cloth, when it is deep and filled with water, a party must be placed on the counterscarp, opposite to the landing-place, ready to fire at the garrison if they are alarmed, and oppose the mounting on the rampart. If the ditch is dry, the ladders are fixed in some place farthest distant from the centre; and as soon as they get upon the rampart, they put themselves in order to receive the enemy; if the centre should be surprised and silently overcome, the detachment hastens to break open the gate, and to let in the rest of the party. If the ditch is wet, the rampart high, and provided with a revetement, it will be difficult to surprise the town in this way; but if there is no revetement, the troops may hide themselves along the outside of the rampart till all are over. Since the invention and use of gunpowder, and the walls of cities have been flanked, they are seldom taken by escalade.

ESCALLONIA, in botany: A genus of the monogynia order, belonging to the pentandria class of plants. The fruit is bilocular and polyspermous; the petals distant and tongue-shaped; the stigma headed.

ESCAPE, in law; a violent or privy evasion out of some lawful restraint, without being delivered by due course of law. There are two sorts of escapes, voluntary and negligent. Voluntary, when a man arrests another for felony, or other crime, and afterwards lets him go freely by consent; in which case, the party that permits such escape is held guilty, committed, and must answer for it. Negligent escape, on the contrary, is where one is arrested, and afterwards escapes against the will of the person that arrested him, and is not pursued with fresh suit, and retaken before the person pursuing hath lost sight of him. By stat. 8 and 9 Will. III. c. 26. the keepers of prisons conniving at escapes shall forfeit 500 l; and in civil cases the sheriff is answerable for the debt.

ESCHALOT, or **SHALLOT**. See **ALLIUM**.

ESCHAR, in surgery, the crust or scab occasioned by burns or caustic medicines.

ESCHARA, in natural history, the name of a species of coralline, &c. the characters of which are these: they are of a stony or coral-like hardness, and resemble a woven cloth in their texture; and the microscope informs us, that they consist of arrangements of very small cells, whose surfaces appear much in that form.

Linnaeus makes it a species of millepora, in the class of lithophytes. See Plate CXLVIII. fig. 9. 10.

The narrow-leaved hornwrack, fig. 9. divides as it rises, into narrow leaves made up of regular rows of oblong square-shaped cells placed alternately by each other, and opposite to an equal number on the other side of the leaf, like an honeycomb: from these leaves proceed other still smaller foliaceous ramifications, many of which seem to be connected at the lower part by tubuli, as in the corallines; by which means they can ply to and fro more freely in the water.—e, Gives the natural appearance of this coralline. E represents two leaves with their tubuli and cells magnified. E 1 is a cross section of one of the leaves at E, showing the partition and inner form of their cells.

The broad-leaved hornwrack, fig. 10. when fresh taken out of the sea, is of a spongy soft texture, and smells very fishy; but when it has lain for some time on the shore, it becomes stiff and horny, like some sort of withered leaves. Both surfaces, when examined by glasses, appear to be covered with cells; and, when a piece of it is cut across, one may discover the thin membrane that serves as a base to the cells of each surface. The form of the cells is very remarkable, each one being arched at the top, and contracted a little at the lower part of the sides to make way for the arches of the two next adjoining cells; so that by this particular construction no room is lost. The entrance of the cells is immediately under the arch of each cell, and the walls of the cells seem to be fortified with spines. Jussieu discovered small polypes extending themselves out of these cells, which he has described in the memoirs of the Academy of Sciences 1742.—f, Gives the natural appearance of a leafy branch of this coralline. F is a part of a leaf magnified to show the superficial figure of the cells, and the manner in which they are disposed. F 1 shows a cross section of a leaf, and discovers the several partitions of the cells.

At the entrance of many of the cells a small testaceous body like a bivalve shell is discovered: F 2, the figure of the cell, with the shell in it; it is of a transparent amber colour, so clear that one may see the dead animal through it, represented by the black spot.

ESCHEAT, in law, signifies any lands or tenements that casually fall to a lord within his manor. It is one of the consequences of tenure in chivalry: (See *FEODAL System*, *KNIGHT-Service*, and *TENURE*). It is the determination of the tenure or dissolution of the mutual bond between the lord and tenant, from the extinction of the blood of the latter by either natural or civil means: if he died without heirs of his blood; or if his blood was corrupted and stained by commission of treason or felony; whereby every inheritable quality was entirely blotted out and abolished. In such cases the land escheated or fell back to the lord of the fee; that is, the tenure was determined by breach of the original condition, expressed or implied in the feudal donation. In the one case, there were no heirs subsisting of the blood of the first feudatory or purchaser, to which heirs alone the grant of the feud extended: in the other, the tenant, by perpetrating an atrocious crime, showed that he was no

Eschara,
Escheat.

Escheat
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Escouade.

longer to be trusted as a vassal, having forgotten his duty as a subject; and therefore forfeited his feud, which he held under the implied condition that he should not be a traitor or a felon. The consequence of which in both cases was, that the gift being determined, resulted back to the lord who gave it.

The word *escheat* is sometimes used for the place or circuit within which the king or other lord is intitled to escheats; also for a writ to recover the same from the person in possession after the tenant's death.

ESCHEAT, in Scots law, is that forfeiture which is incurred upon a person's being denounced a rebel. See LAW, Part III. N^o clxvi. 12.

ESCHEVIN, or ECHEVIN (*Scabinus*), in the French and Dutch polity, a magistrate elected by the inhabitants of a city, to take care of their common concerns, the good order, conveniency, and decoration of the city, &c.

At Paris there is a prevot and four *eschevins*; in most other cities a mayor and *eschevins*. In Languedoc, Provence, and Dauphiné, they are called *consuls*; at Toulouse, *capitouls*; and *jurats* at Bourdeaux.

Anciently the *eschevins* were the assessors and counsellors of the comites or judges of cities; on which account they were called in some places *pairs*, *parés*; they even took cognizance of petty causes themselves.

Du-Cange observes, that the judges and their assessors, who were chosen by the inhabitants, were called *scabini* "eschevins," and their college *scabinagium* or "eschevinage."

In Holland, the *scabins* or *eschevins* judge of all civil affairs at first hand. They also take cognizance of criminal matters: and if the criminal confess himself guilty, they can see their sentence executed without appeal. They can even give torture. The number is not the same in all cities; at Amsterdam there are nine, at Rotterdam seven, &c.

ESCHRAKITES, or ESRAKITES, a sect of philosophers, among the Mahometans, who adhere to the doctrines and opinions of Plato. The word is derived from the Arabic *شراق* *schraca*, which in the fourth conjugation *أشراق* *aschraca*, signifies "to shine, glitter like the sun;" so that *Eschrakite* seems to import "illuminated."

The *Eschrakites*, or Mahometan Platonists, place their highest good and happiness in the contemplation of the Divine Majesty; despising the gross imaginations of the Alcoran touching paradise. They are very careful in avoiding all vice; they preserve an equal and easy temper, love music, and divert themselves with composing little poems or spiritual songs. The shacicks or priests, and the chief among the preachers of the imperial mosques, are *Eschrakites*.

ESCLAIRCISSEMENT, a French term adopted into our language, signifying the explaining or clearing up of some difficulty or obscurity.

ESCORT, a French term, sometimes used in English authors, to denote a convoy or company of armed men, attending some person or thing, in a journey or voyage, to defend or secure it from insults. Some derive the word from the Latin *cohors*.

ESCOUADE, or SQUAD, is usually the third or fourth part of a company of foot; so divided for mounting guards, and for the more convenient re-

lieving of one another. It is equivalent to a brigade of a troop of horse. See BRIGADE.

ESCUAGE, in our old customs, a kind of knight-service, called *service of the shield*, by which the tenant was bound to follow his lord to the wars at his own charge. See the articles CHIVALRY, *FEODAL System*, and *KNIGHT-Service*.

ESCULAPIUS. See ÆSCULAPIUS.

ESCULENT, an appellation given to such plants or the roots of them as may be eaten: such are beets, carrots, artichokes, leeks, onions, parsnips, potatoes, radishes, scorzonera, &c.

ESCURIAL, a royal residence of Spain, situated about 15 miles north-west of Madrid. It is the largest and most superb structure in the whole kingdom, and perhaps one of the finest in Europe. The word is Arabic, meaning "a place full of rocks." It is built in a dry barren spot, surrounded with rugged mountains, inasmuch that every thing which grows there is owing to art. This place was chosen, it is said, for the sake of the stone wherewith the fabric is built, which is got from a mountain just by, and is very durable; and the design of erecting it was to commemorate a victory which Philip II. obtained over the French (but by the assistance of the English forces) at St Quintin, on St Laurence's day, in the year 1557. The Spanish description of this structure forms a sizeable quarto volume, and it is said that its founder expended upon it six millions of ducats. The apartments are decorated with an astonishing variety of paintings, sculpture, tapestry, ornaments of gold and silver, marble, jasper, gems, and other curious stones, surpassing all imagination. This building, besides its palace, contains a church, large and richly ornamented; a mausoleum; cloisters; a convent; a college; and a library, containing about 30,000 volumes; besides large apartments for all kinds of artists and mechanics, noble walks, with extensive parks and gardens, beautified with fountains and costly ornaments. The fathers that live in the convent are 200, and they have an annual revenue of 12,000*l*. It was begun by Philip in 1562, five years after the battle; and completed in 22 years. It consists of several courts and quadrangles, which altogether are disposed in the shape of a gridiron, the instrument of the martyrdom of St Laurence; the apartment where the king resides forms the handle. The building is a long square of 640 by 580, and the height up to the roof is all round 60 feet, except on the garden side, where the ground is more taken away. At each angle is a square tower 200 feet high. The number of windows in the west front is 200; in the east front 366. The orders employed are Doric and Ionic. There are three doors in the principal front. Over the grand entrance are the arms of Spain, carved in stone; and a little higher in a nich, a statue of St Laurence in a deacon's habit, with a gilt gridiron in his right hand, and a book in his left. Directly over the door is a basso relievo of two enormous gridirons in stone. This vast structure, however, with its narrow high towers, small windows, and steep sloping roof, exhibits a very uncouth style of architecture; at the same time that the domes, and the immense extent of its fronts, render it a wonderfully grand object from every point of view. The church, which is in the centre of all, is large.

Escuage
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Escorial.

Escorial, large, awful, and richly but not affectedly ornamented. **Escutcheon** The cupola is bold and light. The high altar is composed of rich marbles, agates, and jaspers of great rarity, the produce of this kingdom. Two magnificent *catafalques* fill up the side arcades of this sanctuary: on one the emperor Charles V. his wife, daughter, and two sisters, are represented in bronze, larger than life, kneeling; opposite are the effigies of Philip II. and of his three wives, of the same materials, and in the same devout attitude. Underneath is the burial-place of the royal family, called the *Pantheon*. Twenty-five steps lead down to this vault, over the door of which is an inscription, denoting, that

Hic locus, sacre mortalitatis exuvii Catholicorum Regum, &c.

was intended by Charles the emperor, resolved upon by Philip II. begun by Philip III. and completed by Philip IV. The mausoleum is circular, 36 feet diameter, incrusted with fine marbles in an elegant taste. The bodies of the kings and queens lie in tombs of marble, in niches, one above the other. The plan of these sepulchres is grand, and executed with a princely magnificence; but, as a modern traveller observes, in a style rather too gay, too light, and too delicately fitted up for the idea we are apt to form of a chapel destined for the reception of the dead. The collection of pictures dispersed about various parts of the church, sacristy, and convent, has been considered as equal, if not superior, to any gallery in Europe except that of Dresden. Formed out of the spoils of Italy, and the wasted cabinet of that unfortunate diletante Charles I. of England, it contains some of the most capital works of the greatest painters that have flourished since the revival of the art. In the sacristy is an altar called *La santa Forma*: this is a kind of tabernacle or *custodia* of gems, marbles, woods, and other precious materials, inlaid in gilt bronze; in which, rather than in the excellence of the workmanship or taste of the design, consists the merit of this rock of riches. Before it hangs a curtain, on which Coello has represented Charles II. and all his court in procession, coming to place this *Forma*. This is esteemed one of the most curious collections of portraits in the world; for all the persons are drawn with the greatest strength of colour and truth of expression, and are said to be perfect resemblances not only of the monarch and grandees, but even of the monks, servants, and guards. The statues, busts, and medallions of the Escorial, are not in any great number, nor very remarkable for their excellence: but the library contains a most precious collection of manuscripts, many fine drawings, and other curiosities. Notwithstanding the coldness of the exposure, the late king, for the sake of hunting, used to pass here several months of the year; and to make the place less inconvenient to his attendants and the nobility, he built an entire new town adjoining to it.

ESCUTCHEON, or **SCUTCHEON**, in heraldry, is derived from the French *escuffon*, and that from the Latin *scutum*, and signifies the shield whereon coats of arms are represented.

Most nations of the remotest antiquity were wont to have their shields distinguished by certain marks painted on them; and to have such on their shields was a token of honour, none being permitted to have them till they had performed some honourable action.

The escutcheon, as used at present, is square, only rounded off at the bottom.

ESDRAS, a Jewish priest, and doctor of the law. Artaxerxes Longimanus sent him with rich presents for the use and ornament of the temple at Jerusalem, rebuilt under Zerubbabel; the king also ordered the neighbouring governors to provide him with what conduced to the pomp of the Jewish religion, and to exempt the priests from paying taxes. He is supposed to be the collector of the Canon of Scripture; and that, by divine inspiration, he added some things which happened after the deaths of the authors. It is guessed he wrote the Chronicles, besides those books which bear his name, the two last of which are exploded even by the church of Rome.

ESK, the name of several rivers both in England and Scotland, particularly of one which forms part of the boundary between the two kingdoms. It runs from north-east to south-west, and gives name to the county of Eskdale.

ESKI-HISSAR. See **STRATONICEA**.

ESKIMAU. See **ESQUIMAU**.

ESNE, a considerable sea-port town of Upper Egypt. It is governed by an Arabian prince, and by a cachef, dependant on the bey of Girze. The Mahometans have several mosques here, and the coptis a church served by two priests. "Esne (says Abulfeda), remarkable for its public baths and its commerce, is built on the westward of the Nile, between Assouan and Cous, but nearer to this latter. It acknowledges, adds the geographer of Nubia, the coptis for founders. Its well cultivated territory abounds in grain and palm trees. It is surrounded by gardens filled with fruit trees. One admires here several ancient monuments constructed by the coptis, and superb ruins." This description answers to Esne in our time, which is situated on the edge of a rich country, and shaded by groves of orange trees loaded with fruits and flowers. This town, formerly called *Latopolis*, revered Minerva and the fish *Latus* (Strabo). It contains within its boundary an antique temple; thick walls inclose it on three sides. Six large fluted columns, crowned by a capital ornamented with the palm leaf, form the facade of it; 18 others support the roof, which is composed of large squares of marble; the building is surrounded by a freeze, and innumerable hieroglyphics cover its exterior aspects.

A little to the south of the town are seen the ruins of a monastery founded by St Helena, and near it the burying place of the martyrs, adorned with tombs crowned by cupolas, supported by arcades. The inhabitants of Esne having revolted against the persecution of Dioclesian, that emperor destroyed this town and put them to the sword. This place, consecrated by religion, is become a celebrated pilgrimage among the Coptis. They repair thither from the most distant provinces of the kingdom. In the chain of mountains which stretches to the eastward of the Nile, and nearly opposite Esne, are quarries of a soft stone, called *Baram*. It is made use of for kitchen utensils. It hardens in the fire, and forms excellent kettles and pans, which give no bad taste to the victuals.

ESOX, in ichthyology, a genus of fishes belonging to the order of abdominales. The body is elongated; the head is plainish above; the upper jaw is plain, and

Esdra
||
Esox.

Esop.

and shorter than the under one, which is dotted; and the branchiostege membrane has from seven to twelve rays.

1. The *LUCIUS*, or *PIKE*, has a flat head: the upper jaw is broad, and shorter than the lower: the under jaw turns up a little at the end, and is marked with minute punctures. The teeth are very sharp, disposed only in the front of the upper jaw, but in both sides of the lower; in the roof of the mouth, and often in the tongue. The slit of the mouth, or the gape, is very wide; the eyes small. The pike is common in most of the lakes of Europe; but the largest are those taken in Lapland, which, according to Scheffer, are sometimes eight feet long. They are taken there in great abundance, dried, and exported for sale. The largest fish of this kind said to be caught in England, weighed 35 pounds. All writers who treat of this species bring instances of its voraciousness. It hath been known to choke itself by attempting to swallow one of its own species which proved too large a morsel. Yet its jaws are very loosely connected, and have on each side an additional bone like the jaw of a viper, which renders them capable of greater distension when it swallows its prey. It does not confine itself to feed on fish and frogs; it will devour the water-rat, and draw down the young ducks as they are swimming about. But there are instances of its fierceness still more surprising, and which indeed border a little on the marvellous. Gefner relates, that a famished pike in the Rhone, seized on the lips of a mule that was brought to water, and that the beast drew the fish out before it could disengage itself; that people have been bit by these voracious creatures while they were washing their legs; and that the pike will even contend with the otter for its prey, and endeavour to force it out of its mouth. Small fishes show the same uneasiness and detestation at the presence of this tyrant, that the little birds do at the sight of the hawk or owl. When the pike lies dormant near the surface, as is frequently the case, the lesser fishes are often observed to swim around it in vast numbers and in great anxiety. Pikes are often haltered in a noose, and taken while they thus lie asleep, as they are often found in the ditches near the Thames, in the month of May. In the shallow water of the Lincolnshire fens they are often taken in a manner, we believe, peculiar to that country and to the island of Ceylon. The fisherman makes use of what is called a *crown-net*; which is no more than a hemispherical basket, open at top and bottom. He stands at the end of one of the little fen-boats, and frequently puts his basket down to the bottom of the water; then poking a stick into it, discovers whether he has any booty by the striking of the fish; and vast numbers of pike are taken in this manner. The longevity of this fish is very remarkable, if we may credit the accounts given of it. Rzaczynski tells us of one that was 90 years old; but Gefner relates, that, in the year 1497, a pike was taken near Hailbrun in Suabia, with a brazen ring affixed to it, on which were these words in Greek characters: "I am the fish which was first put into this lake by the governor of the universe, Frederick the Second, the 5th of October 1230:" So that the former must have been an infant to this Methusalem of a fish. Pikes spawn in March or April, accord-

ing to the coldness or warmth of the weather. When they are in high season, their colours are very fine, being green, spotted with bright yellow; and the gills are of a most vivid and full red. When out of season, the green changes to a grey, and the yellow spots turn pale.

2. The *BELONE*, or *GAR*, sometimes grows to the length of three feet or more. The jaws are very long, slender, and sharp-pointed; the under jaw extends much farther than the upper; and the edges of both are armed with numbers of short and slender teeth: the tongue is small: the eyes are large; the irides silvery; the nostrils wide and round. The body is slender, the belly quite flat, bounded on both sides by a rough line. The tail is much forked. The colours are extremely beautiful when the fish is in the water: the back is of a fine green, beneath which appears a rich changeable blue and purple: the sides and belly are of a fine silvery hue. This fish, which is found in many places, is known by the name of the *see-needle*. It comes in shoals on our coasts in the beginning of summer, and precedes the mackerel: it has a resemblance to it in taste; but the light green which stains the back-bone of this fish gives many people a disgust to it.

3. The *SAURUS*, or *SAURY*, is 11 inches in length: the nose slender; the jaws produced like those of the sea-needle, but of equal length: the eyes large: the body anguilliform; but towards the tail grows suddenly smaller, and tapers to a very inconsiderable girth. The tail is much forked: the back dusky: the belly bright and silvery. Great numbers of these fish were thrown ashore on the sands of Leith near Edinburgh, after a great storm in November 1768. Rondeletius describes this species among the fish of the Mediterranean; but speaks of it as a rare kind.

4. The *BARRACUDA* of Catesby, is found in great numbers about the seas of the Bahamas and as far as Jamaica. Its body and head very much resemble the European pike: the eyes are large: the mouth is very wide: the under jaw longer than the upper: there are four very large and sharp teeth in the front of the upper jaw; in that of the lower, a single great and sharp tooth: there are two dorsal fins: the tail is large and forked: colour a deep brown, whitish on the belly. It grows to the length of 10 feet. It swims exceedingly swift, and is of dreadful voracity: will attack and devour men when they are bathing. The flesh has a disagreeable smell and taste, and is frequently poisonous; causing great sickness, vomiting, intolerable pains in the head, and loss of hair and nails: yet the hungry Bahamans formerly were under the necessity, at times, of feeding on it.

ESPALIERS, in gardening, are rows of trees planted about a whole garden or plantation, or in hedges, in such a manner as to inclose quarters or separate parts of a garden; and are trained up regularly to a lattice of wood-work in a close hedge for the defence of tender plants against the injuries of wind and weather. They are of admirable use and beauty in a kitchen-garden, serving not only to shelter the tender plants, but screen them from the sight of persons in the walks.

The trees chiefly planted for espaliers, are apples, pears, and some plums: some plant apples grafted upon paradise-stocks: but as these are of short duration, it is better to plant those grafted upon crabstock, or upon

Esop.
Espaliers.

Esplanade
Esquilæ.

upon what the gardeners call *Dutch-stocks*; which will both cause them to bear sooner, and prevent their growing too luxuriant. The best kind of apple for this purpose, are the golden pippen, nonpareil, renet, &c. and the best sort of pear, are the jargonelle, blanquette, &c. These last, if designed for a strong moist soil, should be grafted upon quince-stocks; but if for a dry soil, upon free-stocks.

While the trees are young, it will be sufficient to drive a few stakes into the ground on each side of them; fastening the branches to these in an horizontal position, as they are produced. This method will do for the three first years; after which an espalier should be made of ash-poles, whereof there must be two sorts, larger and smaller; the former to be driven upright into the ground a foot asunder, and the latter, or slender poles, to be nailed across these, at about nine inches. Some prefer to this another sort of espalier, made of square timber cut to any size: these are, indeed, more sightly, but withal vastly more expensive.

When the espalier is thus framed, the branches are to be fastened to it with osier-twigs; observing to train them in an horizontal position, and at equal distances. Fruit-trees thus managed are preferable to any others; not only as bearing better-tasted fruit, but as taking up very little room in a garden, so as to be less hurtful to plants which grow in the quarters.

ESPLANADE, in fortification, the sloping of the parapet of the covered-way towards the campaign.

ESPLEES, in law, the general products which lands yield, or the profit or commodity that is to be taken or made of a thing.

ESPOUSALS, in law, signify a contract or promise made between a man and a woman to marry each other; and in cases where marriages may be consummated espousals go before. Marriage is termed an espousal *de brasenti*.

The espousals amongst the Jews were either by writing, or by a piece of silver given and received, or by cohabitation. Amongst the Greeks, after the parents and friends of the young couple had finished their negotiation, the couple themselves pledged their faith to each other, the man swearing that he would be constant and true, the woman that she would marry him, and make him master of all she had. Then they ratified their agreement by a kiss and joining right hands.

Amongst the Romans the espousals consisted in an engagement of friends on both sides, whether absent or present, in public or without witnesses. But the common way was by writings drawn up by common consent, and sealed by both parties; besides this, the man sent a ring to the woman, consisting of iron and without a stone.

ESQUILÆ (anc. geog.), one of the seven hills of Rome, which Varro will have to be two, viz. Cispus and Oppius; also Mons Esquilinus, softened from Exquilinus; and this again from Excubinus, the watch or guard Romulus kept here, from a jealousy he entertained of his colleague Titus Tatius. On the east side it reached the city walls; on the south, the Via Lavicana; on the west, the wide valley between mount Coelius and the Palatine; on the north, the Mons Viminalis; on the east side was the Porta Esquilina. This hill by some of the ancients was called *Suburranus*, from the

street *Suburra* to the north of it: by the poets, *Esquilus*. Esquimaux

ESQUIMAUX, a people of North America inhabiting all that vast tract of land known by the name of *Labrador*, or *New Britain*.—They differ very considerably, both in aspect and behaviour, from the other American nations; agreeing in most respects with the inhabitants of West Greenland. See *New Britain*, and *GREENLAND*.

ESQUIRE (from the French *escu*, and the Latin *scutum*, in Greek σκῦτον, which signifies an hide, of which shields were anciently made, and afterwards covered; for, in the time of the Anglo-Saxons, the shields had a covering of leather), was originally he who, attending a knight in time of war, did carry his shield; whence he was called *escuyer* in French, and *scutifer*, or *armiger*, i. e. armour-bearer, in Latin. Hotoman says, that those whom the French call *esquires*, were a military kind of vassals, having *jus scuti*, viz. liberty to bear a shield, and in it the ensigns of their family, in token of their gentility or dignity. But this addition hath not of long time had any relation to the office or employment of the person to whom it hath been attributed, as to carrying of arms, &c. but hath been merely a title of dignity, and next in degree to a knight. For those to whom this title is now due, see the article *COMMONALTY*. Officers of the king's courts, and of the king's household, counsellors at law, justices of the peace, are only *esquires* in reputation; and he who is a justice of peace has this title only during the time he is in commission, and no longer, if he is not otherwise qualified to bear it. A sheriff of a county being a superior officer, bears the title of *esquire* during his life; in respect of the great trust he has in the commonwealth. The chief of some ancient families are *esquires* by prescription; and in late acts of parliament for poll-money, many wealthy persons commonly reputed to be such, were ranked among the *esquires* of this kingdom.

There is a general opinion, that every gentleman of landed property who has L.300 a-year, is an *esquire*; which is a vulgar error: for no money whatsoever, or landed property, will give a man properly this title, unless he comes within one of the above rules: and no person can ascribe this title where it is not due, unless he pleases; there being no difficulty in drawing the line by the accounts given above and in the article *COMMONALTY*: but the meaner ranks of people, who know no better, do often basely prostitute this title; and, to the great confusion of all rank and precedence, every man who makes a decent appearance, far from thinking himself any way ridiculed by finding the superscription of his letters thus decorated, is fully gratified by such an address.

ESQUIRES of the King, are such as have that title by creation, wherein there is some formality used, as the putting about their necks a collar of SS, and bestowing on them a pair of silver spurs, &c.

ESRAKITES. See *ESCHRAKITES*.

ESSAY, a trial or experiment for proving the quality of any thing; or an attempt to learn, whether or not any invention will succeed.

ESSAY, in literature, a peculiar kind of composition, the character whereof is to be free, easy, and natural;

Essay.

¹ **Effaying.** tural; not tied to strict order or method, nor worked up and finished like a formal system.

ESSAYING, or **ASSAYING**, in chemistry and metallurgy, signifies the examination of a small quantity of any ore or mineral by fire, in order to discover its contents. This is very necessary for those who intend to deal largely in metallurgic operations, in order to avoid unnecessary expence, by becoming previously acquainted with the nature of the ore.

² **History of the art.**

The first attempts in this way were no doubt extremely rude; but succeeding trials have advanced it to the form of a science or art practised by numbers of people under the title of *essay-masters*. No treatise was published on this subject till after the middle of the 16th century; and the first book we have upon it is attributed to Lazarus Ercker, which appeared in 1574. Agricola, however, in his seventh book *De re Metallica*, published in 1576, described both the instruments and processes, illustrating the whole with plates; and there is incontestable evidence that this treatise had been presented to the elector of Saxony in 1567, tho' it did not appear to the world till after the publication of Ercker's book. Since that time, the art has been greatly improved; but the operations in the dry way are not materially different from those described under **METALLURGY**. The **BLOW-PIPE** likewise affords an excellent method of examining small quantities of metal in the dry way; but the greatest improvement hitherto made in it is that of **effaying** by the moist way introduced by Mr Bergman.

² The moist way of effaying introduced by Mr Bergman.

³ **Requisites** for effaying in the dry way.

This celebrated chemist observes, that in the *Docimasia Sicca*, or effaying in the dry way, three things are requisite: 1. That the metal contained in the ore be all reduced to a complete form; for such part of it as is deficient in that respect cannot be united with the eliquated metal. 2. That the whole be collected into one mass; for when it is dispersed in numerous small grains, some of them are very easily scattered, and diminish the weight. 3. That the metallic form be preserved; for the extracted regulus must inevitably be diminished more or less by calcination. All these requisites are frequently effected conveniently enough in a crucible by fusion with proper strata of charcoal, provided the ore is free from sulphur and other volatile mixtures, and is entirely without a matrice, or united to one that can be melted by a moderate degree of heat; but if the matrice be refractory, notwithstanding the most subtile pulverisation, it will cover many of the metallic particles, and thus the reduction and fusion will be in some measure prevented. When this happens to be the case, we must add such other substances as not only promote fusion, but make the matter flow sufficiently thin to allow the reguline particles to fall to the bottom. These substances, which from the effect they have on the matter are called *fluxes*, are of a saline nature, and must therefore necessarily corrode the metals more or less; and hence the scoria, which are almost always tinged, contain a quantity of calcined metal. But as long as we are destitute of a sure method of measuring intense degrees of heat, and as long as it is necessary to perform the operation

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in close vessels to prevent the access of air, the force and proper continuance of the fire will be uncertain (A).

Now, by every excess or defect in this point some part of the regulus is lost; so that any judgment of the goodness of the ore, formed from the weight of the regulus, must be fallacious, or at least somewhat inaccurate.

Hence we may understand, that experiments upon ores made in the dry way, are liable to many faults and imperfections; to which we may add the following, viz. that a given quantity of ore subjected to trial almost always exceeds in weight the regulus to be extracted from it. Now, since it is impossible to avoid a certain loss both during calcination and fusion, this loss will be the more remarkable, as the mass to be weighed becomes ultimately lighter. The case is quite otherwise with experiments made in the moist way; for here the weighty sediment, from which the quantity of the contents is judged, is never less, but often greater, than that obtained by fire.

In the attempts made to essay ores in the humid way previous to those of Mr Bergman, both methods were used, the metallic part being extracted by a menstruum, and afterwards reduced by fire. Our author, however, has now shown a method of performing the operation without either calcination or fusion. "It must indeed be confessed (says he), that experiments in the humid way often require more care and pains than the other; but if accurate conclusions are thereby obtained, we ought not to grudge the slowness. Besides, in many cases this method is more expeditious than the other; and indeed almost always, if we content ourselves with such discoveries as can be made by the common calcinations and fusions: nay, sometimes the dry method is obviously insufficient, when the metallic content is either very small or volatile; but particularly if it be inflammable, as is the case with zinc."

In this method the ores to be examined should be reduced to a very subtile powder by pulverization and calcination. In dissolving such ores as contain sulphur, we ought to employ the vitriolic or marine acid; for the nitrous, by long continued heat, destroys the sulphur. Too great heat also dissipates some of it in vapours, or melts it into globules containing heterogeneous matters; therefore boiling ought to be avoided where it can be done. All the precipitates must be carefully collected, washed, and dried. Distilled water ought constantly to be used, and all the menstrua carefully depurated. Vitriolic acid our author calls *diluted*, when its specific gravity is below 1.3, the nitrous when below 1.2, and the marine when below 1.1. The precipitations should be carefully made in glass vessels; so that nothing may remain either through the deficiency of the precipitant, or be redissolved through its too great quantity. The clear liquor is to be decanted from the precipitate, water poured on in its place, the vessel shaken, and then suffered to stand; the water again decanted off, and more poured on in its stead, until it will no longer affect certain precipitants by which it must be examined. The sediment is then to be collected on a filter, the latter being previously weighed,

⁴ **Deficiencies** of the dry way of effaying.

⁵ **Method of** effaying in the moist way previous to Bergman's improvements.

⁶ **Directions** for effaying in the moist way.

(A) The newly-invented thermometer of Mr Wedgewood has furnished us with a method of measuring intense degrees of heat; but we have not yet heard how far this has been found useful in practice.

Assaying. weighed, and made of paper not impregnated with alum. It is to be dried at first with a gentle heat, but afterwards exposed for five minutes to a heat of 100°. On cooling, it is to be weighed together with the filter; the known weight of which must afterwards be subtracted. The sediment is best washed in a bottle; for a filter when once impregnated with saline matter cannot be freed from it again without great difficulty, especially if an interval of some hours intervenes.

7
Alkalies
pure and
phlogistica-
ted, used by
Mr Berg-
man.

The alkali made use of in Mr Bergman's experiments, was that of soda saturated with aerial acid. His phlogisticated alkali is made by deflagrating equal weights of pure nitre and cream of tartar intimately mixed together; the residuum is the common white flux. Half an ounce of this is dissolved in half a quadrans of distilled water. To this he adds, in a digesting heat, two ounces of Prussian blue, carefully avoiding such an effervescence as may throw any thing over, which easily happens if the quantity be too large. The pigment soon loses its beautiful blue colour, growing not red but black; which shows that a decomposition has taken place. The Prussian blue used in his experiments contained in 100 parts only 23 of the pigment and 77 of the clay; so that if we employ the blue made without any alum, 221 grains of it will saturate the half ounce of alkaline salt more completely than the two ounces of the kind already described. But in whatever manner the operation is performed, after the addition of the last quantity, the whole must be exposed to a stronger digesting heat, and stirred with a wooden spatula. If the liquor be too much diminished by evaporation, the defect must be supplied by adding more water. When the liquor becomes clear, the residuum must be collected upon filtering paper, and gradually washed with warm water until all the soluble part is extracted; when, if the operation has been properly conducted, the filtered liquor amounts to a whole quadrans, of a brownish yellow colour, and so well saturated with colouring matter, that it does not change the colour of paper tinged with Brasil wood. This lixivium, however, contains a small quantity of Prussian blue, about 4 lb. to a cwt. of the alkali. These should be previously separated by an acid, or, which is better, corrected by subtracting from the weight of the sediment 16 assay pounds for each quadrans of the lixivium. When we wish to examine the colour of the precipitate exactly, however, the lixivium we employ must necessarily be well depurated; for by neglecting this precaution we may easily persuade ourselves that any metal precipitated by the lixivium has a blue colour. When we only wish to ascertain the weight, the lixivium, having the small proportion of Prussian blue intermixed, may be employed: but still the proper correction must ultimately be made use of; for the precipitating acid is wont to impair the qualities of the lixivium, and even to destroy them altogether, especially in a warm temperature. Calcareous earth, whether in its mild or caustic state, is also capable of abstracting a coloured substance from iron and other metals.

8
How to
precipitate
metals by
metals.

In the precipitation of metals by metals, it is to be observed, that the acid of the solution ought to be somewhat predominant; but any considerable excess must be corrected occasionally, either by alkali, water, or spirit of wine.

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In the following experiments an assay cwt. was always employed, unless where it is expressly mentioned otherwise: conclusions sufficiently accurate may indeed be obtained from 25 lb. nay sometimes from smaller quantities. In these cases our author mentions the usual quantity; applying to them those formulæ of calculation which are founded on the mutual proportions of the proximate principles constituting metallic salts. By an easy substitution, the same formulæ may be used by those who employ $\frac{1}{4}$ or $\frac{1}{2}$ cwt. We now come to describe the method of assaying the ores of the particular metals.

Assaying.

9
Weights
used in Mr
Bergman's
experi-
ments.

1. *Ores of Gold.* This metal occurs in the bowels of the earth native, possessing a complete metallic form, although in general the small particles of it are so interspersed in various matrices, that they are entirely invisible. It is also found mineralized, or united with sulphur by means of iron or some other metal. These two species of ore we shall consider separately.

10
How to es-
say the ores
of gold.

Native gold is very seldom, if ever, free from heterogeneous matters; the most usual mixtures are copper, silver, and sometimes iron. The first of these remains in the menstruum, and may be separately collected by dissolving the gold in aqua-regia, and precipitating it by martial vitriol: the second falls during the solution, yielding a saluted silver; which, being washed and dried, shows the weight of the silver contained; and the iron may be discovered by phlogisticated alkali. The precipitate occasioned by martial vitriol is pure gold in its metallic state, but very subtilly divided, and therefore its weight requires no correction.

11

Hence it appears how small a portion of gold inherent in the ores of other metals may be extracted; besides, a solution containing the most minute particle of gold instantly produces the purple precipitate of Cassius, with a solution of tin properly prepared.

As to the ore which contains gold adhering to and surrounded by stony particles, 1. We must reduce a determined weight to an impalpable powder by triture and elutriation. Then let the powder, weighed a second time, be boiled in aqua regia, as long as any thing is taken up by the menstruum; after which, let the exhausted ore, well washed, be collected, exsiccated to ignition, and weighed. Let the clear solution (the colour of which, in some degree, affords a method of judging) be precipitated in the usual way by martial vitriol; the precipitate well washed, dried, and weighed, shows the gold, which, added to the weight of the exhausted ore, ought to be equal to the original weight, unless somewhat has been dispersed by the pulverisation, or unless some of the matrix has entered the menstruum. The former of these is discovered by comparing the weights before and after pulverisation; the latter by precipitants.

12
Ores of this
metal pro-
perly so cal-
led.

When grains of gold are mixed with loose earthy particles, they are sometimes easily separated by mechanical application of water.

When the metal is mineralized by sulphur, as in the golden pyrites, let one or more assay cwts. reduced to powder be gently boiled in the nitrous acid, or rather digested in a heat of 50°—80°, lest the sulphur should be destroyed. It is even necessary to employ a more gentle heat for this purpose, that the sulphureous particles,

13
Gold mine-
ralized by
sulphur.

Assaying. ticles, gradually separating, may remain in their natural state; for if they melt, the heterogeneous particles, which ought to have been removed, will be inclosed in the melted mass. The menstruum ought to be added in several portions, about six times the quantity of the ore at each turn. The pyrites is acted upon by this menstruum; an effervescence ensues, which continues for some time; after which a fresh quantity of the acid is to be added, until the sulphur is obtained pure and of its proper colour. From 12 to 16 parts of the acid are usually required to one of the ore. The purity of the sulphur is easily ascertained by caustic alkali.

The matrice, if insoluble in the menstruum, remains at bottom, together with the gold; which is distinguished by its peculiar colour and splendor, and may be separated from the matrice by careful elutriation. The particles of gold assume the form of very small grains, yet such as have angular points discernible by a good eye; and their appearance gives some reason for supposing that they have rather been intimately mixed with the pyrites than dissolved in it. The clear solution, which is generally green, must be evaporated, made red hot, and then weighed. Any other metals that happen to be present besides iron, may be extracted by suitable menstrua; as copper by the volatile alkali, manganese by dilute nitrous acid, with the addition of a little sugar: zinc is scarce ever met with in gold pyrites; but if it should happen to exist, may be extracted by any menstruum; and silver by pure nitrous acid. Calcareous earth, when it happens to form the matrice, unites with nitrous acid, and clay with that of vitriol. The sum of the weights of all the ingredients ought to be equal to the original weight of the ore; and unless any loss has been sustained during the operation, any deficiency may be attributed to the consumption of the sulphur.

¹⁴
Of platina.

2. *Ores of Platina.* The only metal with which platina is known to be alloyed is iron. This may be separated in a great measure by boiling the grains of platina, reduced to as fine a powder as possible, in marine acid, by which the original weight of the grains is generally reduced by about 0.05 of the whole. The depurated platina, dissolved in aqua-regia, easily discovers itself by precipitation with martial vitriol, if any gold be present: and, on the other hand, if platina contains a small quantity of gold, the latter may be discovered by any neutral salt containing vegetable or volatile alkali.

¹⁵
Of silver,

3. *Ores of Silver.* This metal, when found in its native state, is generally alloyed with gold or copper, or both. The silver and copper will be taken up by nitrous acid, leaving the gold at bottom in the form of a black powder, which may be made to assume a more metallic appearance by solution in aqua-regia and precipitation by martial vitriol. The copper remaining in the solution may then be collected by means of iron or aerated alkali.

¹⁶
Mineralized by various substances.

Silver united with sulphur alone (the glassy ore of silver) is of a black colour. To discover the contents of this ore, let it be divided and powdered as much as possible, and then gently boiled for an hour in 25 cwt. of diluted nitrous acid: then after decanting the liquor, the operation is to be repeated with an equal quantity of the menstruum; and even a third time, unless the pure sulphur be now separated. The last particles of

the silver adhere obstinately to the sulphur. If any gold be present, it remains undissolved at the bottom of the vessel. The decanted liquors being collected, are to be deprived of the silver by adding common salt; then if we suppose the precipitate when collected, washed, and dried, to be $=a$, the silver required will be $\frac{100a}{129}$. The weight of the sulphur added to the

above ought to be 100 lb. if the operation has been rightly performed, and no decomposition of the sulphur taken place. The clear liquor, which passes in filtering the luna cornea, easily discovers any other metal which may originally have been mixed with the silver; after which, the earth may be precipitated by means of a common fixed alkali.

It is difficult to separate the remains of the matrice from the sulphureous particles. To effect this, however, let the sum of the weights be first observed; then pour on caustic lixivium, which will dissolve the sulphur by a gentle digesting heat; the matrice then remains alone, and by its weight we can determine that of the sulphur; but we must not continue the digestion longer than is necessary to dissolve the sulphur, lest some of the siliceous earth should also be taken up, tho' Mr Bergman thinks there is no great reason to apprehend any inconvenience of this kind.

The red ore of silver may be examined by reducing Red ¹⁷ *ore.* it to a very subtile powder, and boiling it twice gently in diluted nitrous acid. A part of the menstruum being decanted off, wash the residuum well, then precipitate the silver by means of sea-salt; boil the above-mentioned white powder quickly in aqua-regia until the arsenic be dissolved and the sulphur appear pure. The yellow solution, cautiously decanted, lets fall a very white powder on the addition of a proper quantity; and the small quantity taken up by the water may be obtained by evaporating to dryness. The sulphur separated in this manner, though it seems pure, yet contains some silver which the nitrous acid could not dissolve on account of the arsenic contained in the ore; but when this is taken away by the aqua-regia, the remaining parts of the silver adhere to the marine acid entangled among the sulphureous particles. This luna cornea may be freed from the sulphur by caustic volatile alkali diluted with water, and kept in a well-closed vessel for some days. A weight of alkaline liquor equal to that of the sulphur is sufficient. By weighing the sulphur both before and after the operation, we know the weight of it as well as the luna cornea. Iron may be discovered by means of the phlogisticated alkali.

¹⁸ The white ore of silver, consisting of the metal united White *ore,* with sulphur, arsenic, and copper, is assayed in the following manner. Let 1 cwt. of the ore, reduced to powder, be gently boiled for an hour in a little more than 12 times its weight of diluted nitrous acid. The dry powder becomes black, foul, and sends forth the smell of hepar sulphuris. Part of it is dissolved, and a white residuum remains at length at the bottom. The liquor cleared by subsiding or filtration, contains the silver and copper; the former cannot be precipitated alone by sea-salt, because the marine acid attracts the copper more strongly. A white precipitate indeed, consisting of small needle-like crystals, is thrown down; but it is found on examination

Assaying. to consist of a peculiar combination of marine acid, silver, and copper. The silver therefore must be precipitated by a determined weight of copper, and the latter may be afterwards separated by iron or mild fixed alkali; but from the ultimate weight we must subtract that of such part of the precipitant as has entered the menstruum. The white menstruum must next be boiled in marine acid, and precipitated by water; by which means we obtain the arsenic, along with a small quantity of marine acid which it retains obstinately. After the separation of the arsenic, it remains only to prove the purity of the sulphur by volatile alkali, in order to determine whether it still contains any luna cornea, or copper.

¹⁹
Minerali-
zed by sul-
phur.

Silver mineralized by sulphur sometimes contains antimony also; and this ore often appears in the form of capillary threads of an hoary brown colour. To analyse this, let it be gently boiled, or rather digested, for an hour, in six times its weight of diluted nitrous acid, until the silver is thoroughly dissolved, and all the antimony reduced to a white calx; which, after decanting the liquor, may be separated from the sulphur by marine acid, and precipitated by water. The solution of silver may be precipitated by sea-salt, and 1 cwt. seldom contains more than four ounces. Sometimes there is present in this kind of ore a little copper and iron besides the sulphur and antimony; in which case we may conduct the experiment in the same manner, only with the addition of a double portion of acid. All the metals are easily obtained by precipitating the silver by copper, and the iron by zinc or an alkaline salt.

²⁰
Corneous
Silver ore.

The corneous silver ore, in which the metal is mineralized by the marine and vitriolic acids, has two remarkable varieties; one of which may be cut, and is somewhat malleable; the other brittle, and containing some sulphur besides the acid. An hundred parts of the former, reduced to a fine powder, is to be digested for one day in marine acid, shaking the mixture from time to time. The liquor is then to be decanted clear, and the residuum, previously well washed in water, added to the liquor. A solution of terra ponderosa is to be gradually dropped into the liquor, until it ceases to occasion any precipitation. Suppose the weight of the precipitate, washed and dried, $=a$: now vitriolated terra ponderosa, whose weight is a , contains of acid $0.15a$, which corresponds with vitriolated silver $0.48a$; for from 100 lb. of vitriol of silver, 68.75 of metal is obtained by reduction. But as all the silver is not precipitated from nitrous acid by mineral alkali combined with vitriolic acid, the luna cornea will therefore be $100 - 0.48a$. In the former salt, the silver contained is expressed by $0.33a$; in the latter, by $75.19 - 0.36a$; and therefore the sum required for the 100 will be $75.19 - 0.03a$. The brittle corneous ore likewise contains sulphur; but the saline part may be extracted by volatile alkali, and the quantity of metal afterwards ascertained by the method already described. Or this compound may be reduced in the following manner: Let the mass be mixed with an equal bulk of alkaline salt in a glass mortar, and be formed into a globule by means of a few drops of water: let this globule be put into a crucible, the bottom of which has been previously strewed with sal sodæ, compressed, and covered with the same

alkali. On applying a melting heat, the whole of the metal will then be reduced if the luna cornea has been properly collected.

²¹
4. Ores of Mercury. Native quicksilver is seldom mixed with any other metals than gold, silver, and bismuth. The first remains at the bottom on dissolving the fluid mass in nitrous acid; the second is discovered by sea-salt, which at the same time precipitates the mercury combined with sea-salt; and the third, though it is taken up by the spirit of nitre, is yet precipitated by the mere affusion of water.

²²
The combination of quicksilver with sulphur (native cinnabar) cannot be decomposed either by vitriolic, nitrous, or marine acid. Our author has even attempted in vain to disunite them by boiling for many hours in a solution of caustic fixed alkali in water. There are, however, he tells us, two ways of effecting a perfect decomposition; one by gently boiling for an hour the cinnabar with eight times its weight of an aqua regia, one fourth of which is marine acid; the other by boiling it in marine acid, with the addition of one tenth of the weight of the cinnabar of the black calx of manganese; but the former method is preferable, as no heterogeneous matter is thus added to the mercury. The menstruum is the same in both, viz. the dephlogisticated marine acid; the only difference is, that in the former method it is dephlogisticated by the nitrous acid, and in the latter by the manganese. In whatever manner, however, the sulphur be separated, it may be collected by a filter, and the mercury precipitated by zinc: copper precipitates mercury from the marine acid in a more imperfect manner.—If the ore under examination be very much entangled in the matrice, it must be mechanically freed from it by lotion; after which the soluble parts of the matrice being taken up by the nitrous, marine, or vitriolic acid, the metal itself is separated by aqua-regia.

²³
When mercury is mineralized by the vitriolic acid, it may be separated by the help of the marine acid by trituration or digestion, and the metal precipitated by terra ponderosa dissolved in nitrous acid; after which the weight of the new earthy salt a being given, we can easily learn the quantity of metal contained; yet, as solution of mercury in nitrous acid is not totally precipitated by Glauber's salt, we must not here depend on the weight of the precipitate. By another process, therefore, our author obtained from 100 lb. of vitriol of mercury 33.899 of pure metal, and from an equal weight of corrosive sublimate 75.5; from whence a calculation is easily deduced in the following manner. Let the quantity of vitriolic acid be $=0.15a$; the vitriol of mercury containing this, $=0.44a$; and the combination of mercury with marine acid, $=100 - 0.44a$. In the former salt the mercury constitutes $0.29a$, and in the latter $72.5 = 32a$; so that the whole metallic content in 100 lb. is $72.5 - 0.03a$. The scarcity of this ore, however, renders it still uncertain whether this combination of mercury with marine acid approaches to the nature of corrosive sublimate or mercurius dulcis. In the latter case the calculation comes out different; for mercurius dulcis contains above 0.91 of metal, and the whole content is expressed by $91.18a + 0.29a - 0.40a = 91.18 - 0.11a$.

N. B. The weights on which all these calculations are

are founded, may be found in Bergman's table of precipitates under the article CHEMISTRY.

²⁴
Lead,

5. *Ores of Lead.* This metal, if ever found native, may be easily examined as to its purity by means of nitrous acid, which discovers copper both by its blue colour and precipitation by iron; and silver is discovered by the addition of copper.

²⁵
Mineralized by sulphur;

When lead is mixed with sulphur, and freed from any matrice, it is to be reduced to a fine powder, and then boiled in nitrous or marine acid until the sulphur is obtained pure, which may be ascertained by the caustic fixed alkali. The solution is then to be precipitated by mild mineral alkali, when the lead is either alone or mixed with silver. In the former case, if a be the weight of the precipitate, that of the lead will

be $\frac{100a}{32}$. In the latter, the silver is to be extracted

by volatile alkali, and the residuum multiplied by $\frac{100a}{132}$ will give the weight of the lead. The aerated silver is known by the diminution of weight; and if this be

called b , then the silver in a metallic state will be $\frac{100b}{129}$.

During this operation the solution in marine acid deposits a large quantity of plumbum corneum, which is to be dissolved in water before the precipitation. If antimony happens to be present, it is so much dephlogisticated by the concentrated nitrous acid, that it is calcined and falls to the bottom: the given weight of this multiplied by $\frac{100}{138}$ shows the quantity of regulus dissolved in marine acid, which falls spontaneously upon being dropped into water, and the plumbum corneum is taken up in its place.

Iron is seldom found in galena; however, in case it should happen to exist, its presence may be discovered in the following manner. Let the solution in marine acid be first so far saturated with fixed alkali, that the acid may predominate only a little, and yet all precipitation be carefully avoided. The lead will then be precipitated by a polished plate of iron added during boiling; as will also the silver, which almost always exists in lead. The iron is then to be precipitated by aerated or phlogisticated alkali, and its weight corrected by the part of the metallic plate which is dissolved during precipitation.—When the ore contains any matrice, this is either soluble, and may at first be separated by vinegar; or else is insoluble in common acids, and is found collected at the bottom.

²⁶
By fixed air;

When this metal is mineralized by fixed air, and deprived of all heterogeneous soluble mixtures, it may be dissolved in nitrous acid, and precipitated by aerated mineral alkali; which being done, the quantity of lead is known by the weight of the precipitate as before. But if the matrice be soluble, we must employ the marine acid, and precipitate the metal by iron, as already directed.

²⁷
By acid of phosphorus.

Lead has lately been found mineralized by acid of phosphorus. An hundred pounds of this in powder is dissolved in nitrous acid by means of heat, excepting a few martial particles which commonly remain at the bottom. On adding the vitriolic acid, the dissolved lead falls in the form of a snow-white precipitate; which, when washed, collected, and dried, we may

suppose to weigh a ; in which case the corresponding

lead = $\frac{100a}{143}$. The liquor remaining after precipitation yields, on being evaporated, a phosphoric acid.

6. *Ores of Copper.* This metal, when native, readily dissolves in nitrous acid. Gold, when mixed with it, falls untouched to the bottom in form of a black powder. Silver is soon precipitated by copper; and iron, by boiling the solution for some time, and inspissating to dryness, is gradually calcined and falls to the bottom.

Copper mineralized by sulphur is to be powdered, and gently boiled to dryness in five times its weight of concentrated vitriolic acid. The residuum must then

be well washed with water, until all the metallic part has entered the menstruum. The quantity of water used for the solution ought to be in some degree proportioned to the goodness of the ore; that which contains 0.05 of copper requires about 0.08 of water, and so on. A polished plate of iron, about twice the weight of the copper, is then to be immersed in the solution properly diluted, and the boiling continued until all precipitation ceases. If the quantity of water be too small, the precipitated metal adheres very obstinately to the surface of the iron plate; which, however, may always be freed by making use of a proper quantity of liquid. The precipitated copper, after being well washed, is to be speedily dried; "but yet (says our author) with such a degree of heat as to make the surface of the metal of different colours, which instantly and sensibly increases the weight."

Sometimes the precipitated copper is found mixed with iron, especially in a poor ore; in which case the precipitate must be redissolved in order to obtain a richer solution; and this deposits pure copper, if the operation has been properly conducted. A similar circumstance also takes place in the precipitation of silver by copper; a rich solution yielding the metal pure, but a poor one affording it mixed with copper. When the precipitated copper is alloyed with other metals, they may easily be separated by solution in the nitrous acid. Gold, as has already been observed, remains at the bottom in form of a black powder, and silver is precipitated on a copper plate.

During this process almost all the sulphur is dissipated by the intense heat necessary for evaporating the vitriolic acid to dryness: however, we may judge of its quantity from the sum of the weights of the other ingredients, compared with that of the whole; or a solution in aqua-regia may be made on purpose for collecting the sulphur.

The beautiful green ores of copper called *malachites*, in which the metal is mineralized by fixed air, are totally soluble in acids, and may be precipitated by iron or aerated fixed alkali. In the latter case, supposing the weight of the precipitate to be a , that of the copper will be $\frac{100a}{194}$. Calcareous earth, when any happens

to be present, may be thrown down by aerated alkali, and the metal precipitated by phlogisticated alkali.—Blue calciform copper, in which the metal is also mineralized by aerial acid, is to be analysed in the same way. Calciform red copper is also totally or in great part dissolved with effervescence, though somewhat weaker than the other.

Effaying.

32
Red quartz
affords no
copper by
Bergman's
experi-
ments.

33
Iron.

Mr Bergman has examined by many different ways the red quartz of Mr Cronstedt, supposed to contain a red calx of copper. None of this metal, however, was extracted either by volatile alkali, or boiling the vitriolic acid to dryness upon it. As the siliceous matrices, however, cannot easily be dissolved by the common menstrua, a quantity of mineral fluor was added to the vitriolic acid. The fluor acid has the property of dissolving the particles of quartz, and setting at liberty those of copper which might be entangled among them: but though this experiment always succeeds when copper is present, yet in this substance not the smallest sign of metal could be discovered, and therefore it is probable that Mr Cronstedt was mistaken.

7. *Ores of Iron.* Though some traces of this metal are found almost every where in the mineral kingdom; yet the ores which contain it in considerable quantity, have it either mineralized by sulphur or more or less calcined. Ores of iron are frequently found in Sweden so perfect that they obey the magnet, or are themselves magnetic. These attractive and magnetic ores, though they do not contain much sulphur, are yet seldom entirely without it, though more can be extracted by menstrua. Those saturated with sulphur are called *sulphureous pyrites*, nothing but sulphur being extracted from them; for though they sometimes contain the metal in sufficient quantity to pay the expense of smelting, it is always brittle and untractable in the fire, and is easily corroded by rust on exposure to the open air.

All the ores of iron, when reduced to a very subtile powder, and repeatedly boiled in marine acid, part with their metal; the solution of the pyrites is accelerated by the addition of a small quantity of nitrous acid. In order to obtain the metal by itself, we must precipitate it by phlogisticated alkali; when, if we suppose the weight of the precipitate to be a , the corresponding quantity of metal will be $\frac{a}{6}$; but this must

be corrected according to the quantity of the precipitant. That ore which is naturally soluble by vitriolic acid requires nothing but water to precipitate by means of phlogisticated alkali.

34
Manganese.

Manganese, which is frequently mixed with iron, may easily be discovered by immersing the blue sediment (carefully weighed) in water sharpened by nitrous acid; by which means the part arising from the manganese is dissolved. Other metals sometimes enter the ore of iron in larger quantities; which for the most part render the former useless, by imparting bad qualities to the smelted iron.

35
Of native
tin.

8. *Ores of Tin.* The examination of native tin by the humid method is attended with no difficulty: for the addition of nitrous acid quickly deprives it so far of its phlogiston, that it is reduced to the form of a white calx; the iron and copper, if any be present, remaining in the liquor. An hundred parts of tin corroded by nitrous acid, washed and dried, yielded 140 of calx. Arsenic may be separated by washing with large quantities of warm water; for little enters the acid menstruum. The other metals are but rarely united with native tin.

36
Its pure ore.

The pure ore, is commonly called, according to the magnitude of its crystals, *zinngrausen* or *zwitter*,

by the Germans. These forms cannot be examined in the moist way without great difficulty, as they are not acted upon effectually either by vitriolic, nitrous, or marine acid, or even by aqua-regia. The reason of this insolubility is, that the calx, being well dephlogisticated, is either not taken up at all, or in very small quantity; and besides, being involved in strong particles, the menstrua can scarce have access to it. The following method is recommended by our author as one by which this process may be nearly effected.

"To a very subtile powder of the crystalline tin ore obtained not only by levigation but elutriation, let there be added a quantity of concentrated vitriolic acid, and let this be exposed to a strong digesting heat for several hours: then pour on a small portion of concentrated marine acid; and upon agitating it, a vehement effervescence immediately begins, with a considerable heat arising from the marine acid, which is partly deprived of its water by the vitriolic, and generates a marine acid air. By this method the forces of the two are conjoined: water is to be added in about an hour after, and the clear liquor decanted after the sediment has fallen. This operation is to be repeated with the residuum until the acids can dissolve no more. What remains finally undissolved is nothing more than the stony matrice. Let the solution precipitated by means of aerated alkali = a , and the quantity of regulus will be $\frac{100a}{131}$. The subtile atoms of the crystalline ore, inti-

mately mixed with any matrice, may, after due pulverisation, be separated by washing from a given portion, as the crystals are nearly of six times the specific gravity of water; so that they not only exceed the gravity of the earthy particles, but that of the ores of other metals, and approach even to the lighter metals themselves. The crystalline particles, after being separated, are exposed to the trial above described. The larger distinct crystals can seldom be employed: the most common ore contains particles of them very much dispersed."

The adventitious metals usually found in tin are copper and iron.

9. *Ores of Bismuth.* This semimetal, when native, is easily taken up by nitrous acid, and may then be precipitated by water; after which any other metals that happen to be mixed with the bismuth remain in the liquor, and may be separated by the methods already frequently described. When mineralized by sulphur, the ore is decomposed by slight boiling in the same menstruum; so that the sulphur may be at last obtained; which when washed and collected is to be examined as to its purity and quantity. The solution of the metallic part precipitated by water leaves a white calx; and supposing its weight = a , that of the corresponding metal will be $\frac{100a}{113}$.

Iron is sometimes met with in these ores, which may easily be discovered after the separation of the bismuth.

Bismuth in form of a calx, whether alone or mineralized by aerial acid, is also soluble in nitrous acid, and may be precipitated by water, upon which the heterogeneous matters remain in the liquor. The presence of cobalt is discoverable by its communicating a red colour.

10. *Ores*

Effaying.

37
Chrysal-
line ores of
tin.

38
Bismuth.

39
Minerali-
zed.

Effaying.

40
Nickel,41
Minerali-
zed.42
Arsenic,43
Minerali-
zed by sul-
phur.44
Too much
acid of
nitre must
not be used

10. *Ores of Nickel.* This substance, when found native, may be dissolved by the nitrous acid; and when precipitated by aerated alkali, yields a calx which almost always contains iron, arsenic, and cobalt, in the same proportions in which they usually accompany the regulus obtained in the common way. If silver and bismuth happen to be present, which, however, is very seldom the case, the former is precipitated by common salt before the latter is employed. Sulphur may be separated and collected during solution.

Nickel, mineralized by vitriolic acid, is scarcely ever without iron. A great part of the latter, however, is separated by long and violent boiling in water. Aerated alkali throws down a greenish white precipitate; and if we suppose the weight of this = a , that of the reguline nickel is $= \frac{100a}{135}$. The same metal

mineralized by aerial acid is dissolved by spirit of nitre, and may be precipitated by means of mild alkali.

11. *Ores of Arsenic.* The purity of native arsenic may be examined by dissolving it in four times its weight of aqua-regia, and the solution slowly evaporated without any separation of the metal. The arsenic is then to be precipitated by water, and collected upon a filter; the heterogeneous metals will be contained in the clear liquor which passes through the filter. If any silver be present, it falls to the bottom in conjunction with the marine acid. Iron is hardly ever absent altogether, and is frequently in such quantity, that the mass has a polished appearance, most commonly crystalline, and is commonly known by the name of *misspickel*.

Arsenic mineralized by sulphur is to be dissolved in marine acid, with the addition of the nitrous occasionally, in greater or lesser quantities, so that the sulphur may be separated free from all metallic matter. The sulphur collected, washed, and weighed, indicates the quantity of the arsenical part. This, however, ought to be precipitated separately by water, and weighed; a step which is always necessary where great accuracy is required. Arsenic dissolved by marine acid may also be precipitated in its metallic form by zinc; the solution being previously weakened by spirit of wine. When sulphur alone is united to the arsenic by its different proportions, it produces different colours, from a dilute yellow to an intense red. But if a considerable portion of iron also enters the composition, a white colour is generated, and a very different species of pyrites formed, which is called the *arsenical pyrites*. This may be analyzed by solution in marine acid in the manner already described.

In analyzing arsenical ores in general, we must take care not to add too much nitrous acid, as we would thus take away the whole of the phlogiston, and disengage the arsenical acid. The smallest quantity sufficient for solution ought therefore to be employed; otherwise water will occasion no precipitation: and even with all our caution, it is scarce possible to prevent a small portion of the arsenical acid from being disengaged, especially if the boiling be long continued. This may be recovered by evaporating to dryness, though rarely alone, but united either with the alkaline earths or the metals which are present. Some of the arsenic easily flies off.

12. *Ores of Cobalt.* This semimetal, when native,

almost always contains iron, arsenic, and frequently nickel; whence no doubt it is, that some authors have said that vitriolated cobalt is of a green colour, as well as the other salts containing this semimetal; but the truth is, that they are of an obscure red, unless the nickel be in large quantity. To separate these metals from one another, dissolve the compound mass in water, evaporate to dryness, and extract the cobalt with vinegar. Let the weight of the precipitate be a , and that of the corresponding regulus will be $\frac{100a}{160}$. If the ar-

senic be abundant in the evaporated solution, it may perhaps be precipitated by the effusion of water. Cobalt united with sulphur may be treated in the same way, as it differs from the native cobalt only in containing a small quantity of sulphur, which is to be separated and collected.

Cobalt has been discovered by Mr Brandt in a state of union with vitriolic acid, along with a large quantity of iron, and without any arsenic. This may be examined by solution in aqua regia. The solution is yellow, with scarce any redness, on account of the great quantity of iron. By boiling it assumes an obscure green, and resumes its former colour; a property by which the existence of cobalt is always known. The ore does not appear to contain any sulphur; but a few drops of solution of terra ponderosa dissolved in marine acid immediately discovered the vitriolic acid. Scarce any vestige of arsenic was to be met with. The vitriolic acid, however, though present in such abundance, was yet so far dephlogisticated, that it could not unite with the semimetal into a vitriolated cobalt, and therefore must be considered only as an impurity.

The trichetes of the Greeks, which is found in the mines of Herngrund and Idua, adhering to an argillaceous stone, is found to contain a real cobalt, besides the clay and vitriolic acid. It can only be precipitated by the phlogisticated alkali.

Cobalt frequently exhibits beautiful red efflorescences, sometimes more dilute, and sometimes of a deeper colour. Sometimes it appears like a loose powder, sometimes concrete, and at times forming most beautiful crystals radiating from a centre like a star. These substances always show some vestiges of arsenic; but as this substance is incapable, either in its reguline or calcined state, of imparting a red colour to arsenic, it is reasonable to suppose that it is done by the arsenical acid itself, as all acids have the property of communicating a red colour to cobalt. To determine this point, Mr Bergman made the following experiments. 1. Having artificially combined the acid of arsenic with cobalt, he found an exact resemblance betwixt this compound and the natural crystals above mentioned. 2. On account of the scarcity of the latter substance, he extracted the pure acid of arsenic, first separating it by vitriolic acid, and then absorbing the latter by highly rectified spirit of wine, which takes up only the superfluous acid, leaving the vitriolated cobalt untouched. Natural arsenicated cobalt is scarcely soluble in water, unless the latter be sharpened by an acid; and when thus dissolved it should be precipitated by mild alkali, to discover the quantity of semimetal. Cobalt artificially combined with arsenical acid, and dried, shows the same properties with the natural.

The black calx of cobalt is generally found concreted

Effaying. 49 **Glassy ore of cobalt.** ted into an hard-mass, known by the name of the *glassy ore of cobalt*. This, when pulverised, may be dissolved in the marine acid or aqua-regia, and examined like the former.

50 **Zinc.** 13. *Ores of Zinc.* If ever this semimetal occurs in a native state, its purity may be easily determined, as it is readily soluble in all the acids; and whatever heterogeneous metal is present may be precipitated by zinc.

51 **Mineralized by sulphur and iron.** The pseudo-galena which contains zinc mineralized by sulphur, together with iron, must be carefully treated with nitrous acid, in order to extract the metallic part without decomposing the sulphur. If no other metal than iron be present, it may be precipitated by zinc; but if others also are combined with it, the iron must be calcined, by repeatedly abstracting nitrous acid to dryness, and a new solution, made by vinegar or any other acid, examined.

52 **White vitriol analysed.** To analyse the combination of vitriolic acid and zinc, dissolve the salt in water, and precipitate the solution with mild fixed alkali; when, if the weight of the precipitate be a , that of the regulus will be $\frac{100a}{193}$. When iron is present, as is usually the case, it ought to be precipitated by a known weight of zinc.

53 **Zinc mineralized by fixed air.** This semimetal, mineralized by aerial acid, ought to be dissolved in some of the mineral acids, and then precipitated by phlogisticated alkali or mild fixed alkali. When the former is employed, the weight of the sediment must be divided by 5, in order to ascertain that of the metallic part.

54 **Antimony.** 14. *Ores of Antimony.* The purity of this semimetal, when found native, may be examined by reducing it to a calx with strong nitrous acid: in which case, if it has been entirely pure, there will remain only a small part dissolved in the water, and which will separate on the addition of water. When mineralized by sulphur, the metallic part is taken up by aqua-regia, and the sulphur remains pure. The solution, by boiling with strong nitrous acid, lets fall a calcined antimony; which being separated, the remaining liquor may be examined by phlogisticated alkali or otherwise at pleasure.

55 **Combined with arsenic.** By the addition of a certain quantity of arsenic, crude antimony grows red, frequently exhibiting beautiful fasciculi of filaments radiating from a centre. The presence of arsenic may be discovered by gently boiling the powder in aqua-regia, until the sulphur be obtained pure. The arsenic and antimony are contained in the clear solution, and may be separated in the following manner. Let concentrated nitrous acid be poured on, and the antimony reduced to a white calx by boiling. Let this be collected on a filter; and the liquor that passes through affords arsenic by evaporation, but generally deprived of phlogiston, or reduced to the state of arsenical acid. As the caustic alkali also takes up both sulphur and antimony, it may be advantageously employed, especially for the separation of silver, or other metals which do not yield to this menstruum. A hepar sulphuris is indeed produced; but in this case it dissolves little or nothing.

56 **Manganese.** 15. *Ores of Manganese.* This semimetal accompanies most of the ores of iron, though it has likewise ores of its own in which it predominates, but seldom to be met with. It has never been found native or mineralized by sulphur, but commonly occurs in the form of a calx, generally alone and black, though sometimes

mineralized by the aerial acid. These ores, after being reduced to a subtile powder, must be immersed in any acid, particularly one of the mineral kind, together with a small piece of sugar, in order to supply the phlogiston necessary for dissolving the manganese. Fresh acid is to be poured repeatedly on the calx with sugar, until no more can be extracted by a digesting heat; after which the solution is to be precipitated by mild alkali: and if we suppose the weight of the sediment = a , that of the corresponding regulus will be $\frac{100a}{180}$. The insoluble residuum at bottom either contains heterogeneous mixtures or belongs to the matrix.

To separate the iron from calx of manganese combined with aerial acid, nitrous acid is to be repeatedly abstracted from the ore, and the heat, after each addition, increased to ignition; after which the manganese will be obtained pure, or at least contaminated with iron in a much smaller degree than before. It may then be separated by strong concentrated vinegar or diluted nitrous acid. Manganese, when precipitated from superabundant nitrous acid by phlogisticated alkali, totally dissolves in distilled water; which property affords likewise a method of separating it perfectly from iron.

Besides the foregoing kind of operations which relate only to the ores of metals, *effaying* is used in metallurgic operations to signify the method of determining how much gold or silver is contained in any mass of metal already smelted from its ore.

1. *Essay of the Value of Silver*, to examine its purity, or the quantity of alloy mixed with it. The common method of examining the purity of silver, is by mixing it with a quantity of lead proportionable to the quantity of imperfect metals with which it is supposed to be alloyed; by testing this mixture; and afterwards by weighing the remaining button of silver. The loss of weight which the silver suffers by cupellation shows the quantity of imperfect metals which it contained.

We may hence perceive, that the essay of silver is nothing else than the refining of it by cupellation. The only difference between these two operations is, That when silver is tested merely for the purpose of refining it, its value is generally known; and it is therefore mixed with the due proportion of lead, and tested, without any necessity of attending to the loss of weight it sustains during the operation: whereas, in the essay, all possible methods ought to be employed to ascertain precisely this loss of weight. The first of these operations, or the mere refining of silver, is made in the great, in the smelting of silver ores, and in mints for making money*. The second operation is never made but in small; because the expences of small operations are less than of great, and in the requisite accuracy is more easily attended to. The last operation is our present object, and is to be performed in the following manner.

We suppose, first, that the mass or ingot of silver of which an essay is to be made, consists of 12 parts perfectly equal; and these 12 parts are called *penny-weights*. Thus, if the ingot of silver be an ounce weight, each of these 12 parts will be $\frac{1}{12}$ of an ounce; or if it be a mark, each of these will be $\frac{1}{12}$ of a mark.

Effaying.

57 Combined with aerial acid.

58 Method of effaying silver and gold.

* See Reg.

Assaying. mark, &c. Hence, if the mass of silver be free from all alloy, it is called *silver of 12 penny-weights*; if it contains $\frac{1}{12}$ of its weight of alloy, it is called *silver of 11 penny-weights*; if $\frac{2}{12}$ of its weight be alloy, it is called *silver of 10 penny-weights*; and these 10 penny-weights or parts of pure silver are called *fine penny-weights*.

We ought to observe here concerning these penny-weights, that assayers give also the name *penny-weight* to a weight equal to 24 real grains: which latter real penny-weight must not be confounded with the former, which is only ideal and proportional; and such a confusion is the more likely to take place, as this ideal penny-weight is also, like the former, divided into 24 ideal grains, which are called *fine grains*.

An ingot of fine silver, or silver of 12 penny-weights, contains then 288 fine grains; if this ingot contains $\frac{1}{12}$ part of alloy, it is said to be *silver of 11 penny-weight and 23 grains*; if it contains $\frac{2}{12}$ of alloy, it is called *silver of 11 penny-weight and 22 grains*; if it contains $\frac{3}{12}$, it is called *silver of 11 penny-weight and 10 grains*; and so on. Lastly, the fine grain has also its fractions, as $\frac{1}{2}$, $\frac{1}{4}$ of a grain, &c.

As essays to discover the value of silver are always made in small, assayers only take a small portion of an ingot for the trial; and the custom in France is to take 36 real grains for this purpose, which is consequently the largest weight they employ, and represents 12 fine penny-weights. This weight is subdivided into a sufficient number of other smaller weights, which also represent fractions of fine penny-weights and grains. Thus 18 real grains, which is half of the quantity employed, represent six fine penny-weights; three real grains represent one fine penny-weight, or 24 fine grains; a real grain and a half represent 12 fine grains; and $\frac{1}{3}$ part of a real grain represents $\frac{1}{4}$ part of a fine grain, which is only $\frac{1}{12}$ part of a mass of 12 penny-weights.

We may easily perceive, that weights so small, and essay-balances, ought to be exceedingly accurate. These balances are very small, suspended and inclosed in a box the sides of which are panes of glass, that they may be preserved from dust, and that their motion may not be affected by agitated air, so as to disorder their action *.

* See
(Essay)
Balance.

When an essay of a mass or ingot of silver is to be made, the custom is to make a double essay. For this purpose, two fictitious semi-marks, each of which may be equal to 36 real grains, are to be cut from the ingot. These two portions of silver ought to be weighed very exactly; and they ought also to have been taken from opposite sides of the ingot.

Persons accustomed to these operations know pretty nearly the value of silver merely by the look of the ingot, and still better by rubbing it on a touchstone. By the judgment they form of the purity of the ingot, they regulate the quantity of lead which is to be added to it, as this quantity must be always proportionable to the quantity of imperfect metal mixed with the silver.

Nevertheless, this proportion of lead to the alloy has not been precisely determined. Authors who treat of this subject differ much. They who direct the largest quantity of lead say, that thereby the alloy is more certainly destroyed; and others who direct a small quantity of lead, pretend, that no more of that metal

N^o 119.

Assaying. ought to be used than is absolutely necessary, because it carries off with it always some portion of silver. Every assayer uses his own particular method of proceeding, to which he is attached.

To ascertain these doubtful points, three chemists of the Academy of Sciences at Paris, Messrs Hellot, Tillet, and Macquer, were appointed by the French government. They were directed to ascertain every thing concerning the essay of gold and silver by authenticated experiments, made under the inspection of a minister whose superior knowledge is equal to his desire of public good, and in presence of the officers of the mint.

The experiments made by these chemists, and the consequent regulation, have determined that four parts of lead are requisite for one part of silver of 11 penny-weight and 12 grains, that six parts of lead are requisite for silver of 11 penny-weight, eight parts of lead for silver of 10 penny-weight, 10 parts of lead for silver of nine penny-weight, and so on in the same progression.

Two cupels of equal size and weight are to be chosen. The custom is to use cupels of such a size that their weight shall be equal to that of one half of the lead employed in the essay; because such cupels have been found capable of imbibing all the litharge formed during the operation. These cupels are to be placed together under a muffle in an essay-furnace. The fire is to be kindled, and the cupels are to be made red-hot, and to be kept so during half an hour at least before any metal be put into them. This precaution is necessary to dry and calcine them perfectly; because if they contained any moisture or inflammable matter, an ebullition and effervescence would be occasioned in the essay. When the cupels are heated so as to become almost white, the lead is to be put into them; the fire is to be increased, which is done by opening the door of the ash-hole so as to admit air, till the lead becomes red, smoking, and is agitated by a motion of its parts called its *circulation*, and till its surface becomes smooth and clear.

Then the silver, previously beat into small plates for its easier fusion, is to be put into the cupels; the fire is to be continued, and even increased, by putting hot coals at the mouth of the muffle, till the silver shall have *entered the lead*, that is, till it have melted and mixed with the lead. When the melted matter circulates well, the heat is to be diminished by taking away, partly or entirely, the coals put at the mouth of the muffle, and by closing more or less the doors of the furnace.

The heat ought to be regulated so, that the essays in the cupels shall have surfaces sensibly convex, and shall appear ardent, while the cupels are less red; that the smoke shall rise almost to the roof of the muffle; that undulations shall be made in all directions upon the surfaces of the essays, which are called *circulations*; that their middles shall be smooth, and surrounded with a small circle of litharge, which is continually imbibed by the cupels.

The essays are to be kept in this state till the operation is finished, that is, till the lead and alloy have soaked into the cupel; and the surfaces of the buttons of silver being no longer covered with a pellicle of litharge, become suddenly bright and shining, and are then

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Silver.

then said to *lighten*. If the operation has been well conducted, the two essays ought to become bright nearly at the same time. When the silver has been by this operation well refined, we may see, immediately after it has brightened, the surface of the silver covered with rainbow colours, which quickly undulate and cross each other, and then the buttons become fixed or solid.

The management of the fire is an important article in essays. For if the heat be too great, the lead is scorified and imbibed by the cupel so quickly, that it has not sufficient time to scorify and carry along with it all the alloy; and if the heat be too little, the litharge is gathered upon the surface, and does not penetrate the cupel. The essayers say then, that the essay is *choaked* or *drowned*. In this case the essay does not advance; because the litharge covering the surface of the metal defends it from the contact of air, which is absolutely necessary for the calcination of metals.

We have above related the marks of a successful essay. The heat may be known to be too great, from the convexity of the surface of the melted metal; from a too strong circulation; from the too vivid appearance of the cupel, so that the colours given to it by the litharge cannot be distinguished; and, lastly, by the smoke rising up to the roof of the muffle, or not being at all visible from its being so ardent and red-hot as not to be distinguishable. In this case, the heat must be diminished by shutting the door of the ash-hole: Some essayers, for this purpose, put round the cupels small, oblong, cold pieces of baked clay, which they call *instruments*.

If, on the contrary, the melted metal have a surface not very spherical, relatively to its extent; if the cupel appear dark-coloured, and the smoke of the essay do only creep upon the surface; if the circulation be too weak, and the scoria, which appears like bright drops, have but a dull motion, and be not soaked into the cupel; we may be assured that the heat is too weak; much more may we be assured of it when the metal *fixes*, as the essayers call it. In this case, the fire ought to be increased by opening the door of the ash-hole, and by placing large burning coals at the mouth of the muffle, or even by laying them across upon the cupels.

As soon as the lead is put into the cupels, the fire is to be increased, because they are then cooled by the cold metal; and the lead ought to be quickly melted, to prevent its calx from collecting upon its surface in too great quantity before it be formed into litharge; which it would do, and be difficultly fused, if the heat were too weak.

When the silver is added to the lead, the heat must be still increased; not only because the silver cools the mass, but because it is less fusible than lead. And as all these effects ought to be produced as quickly as possible, more heat is at length given than ought to be continued; and therefore, when the silver has entered the lead, the heat is to be diminished till it becomes of a due intensity for the operation.

During the operation, the heat ought gradually to be augmented to the end of it, both because the metallic mixture becomes less fusible as the quantity of lead diminishes; and also because the lead is more difficultly scorifiable, as it is united with a larger proportion of silver. Hence the essays must be rendered very hot before they brighten.

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When the operation is finished, the cupels are left in the same heat during some seconds, to give time to the last portions of litharge to be entirely absorbed; because, if any of it remained under the buttons of silver, it would stick to them. The fire is then allowed to extinguish, and the cupels to cool gradually, till the buttons have entirely fixed, particularly if they be pretty large; because if they cool too quickly, their surfaces fix and contract before the internal mass, which is thereby so strongly compressed as to burst through the external solid coat and form vegetations, or even to be entirely detached from the rest of the mass, and dissipated. This is called *the vegetation of the button*. It ought to be carefully prevented, because small bits of silver are sometimes thrown out of the cupel.

Lastly, when the buttons are thoroughly fixed, they are to be disengaged from the cupels by a small iron utensil while they are yet hot; otherwise they could not be disengaged clean and free from part of the cupels, which strongly adhere to them when the heat is much diminished.

Nothing then remains to complete the essay, but to weigh the buttons. The diminution of weight which they have sustained by cupellation will show the purity or value of the ingot of silver.

We ought to observe, that as almost all lead naturally contains silver, and that after cupellation this silver is mixed with the silver of the ingot in the button of the essay; before we employ any lead in this operation, we ought to know how much silver it contains, that we may subtract this quantity from the weight of the button, when we compute the fineness of the silver of the ingot essayed. For this purpose essayers generally cupel a certain quantity of their lead separately, and weigh accurately the button of silver it yields: or, at the same time when they essay silver, they put into a third cupel, in the muffle, a quantity of lead equal to that employed in both their essays; and when the operation is finished, and the buttons are to be weighed, they throw the small button produced from the lead alone into the scale which contains the weights; and as this exactly counterpoises the small portion of silver which the essay buttons have received from the lead employed in the cupellation, the weights will show precisely the quantity of silver contained in the ingot, and thus the trouble of calculating is prevented. The small button of silver procured from the cupellation of lead alone is called the *witness*. But to prevent this trouble, essayers generally employ lead which contains no silver, such as that from Willach in Carinthia, which is therefore procured by essayers.

In the second place, we shall observe, that a certain quantity of silver always passes into the cupel, as refiners in the great have long observed, and which happens also in essaying small quantities. The quantity of silver thus absorbed, varies according to the quantity of the lead employed, and the matter and form of the cupels; all which objects will undoubtedly be determined by the above mentioned chemists.

The cupellation which we have now described is exactly the same for essays by which the produce of a silver ore, or of an ore of another metal containing silver, is determined. But as these ores contain frequently gold, and sometimes in considerable quantity, when these essays are made, the buttons of silver obtained

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by the essays ought to be subjected to the operation called *parting*. See SILVER, REFINING, &c.

M. Tillet has published a memoir, showing that essays of silver made in the common method are uncertain and not to be depended upon; and that this uncertainty proceeds from the different quantities of silver absorbed by the cupel in different essays, according as the heat and other circumstances happened to vary. He therefore proposes, in order to render essays accurate, to extract from the cupel the quantity of silver it has absorbed during the operation, and to add this particle of silver to the button, as these two contain the whole quantity of silver in the matter essayed.

The variations in the different results of different essayers, or of the same essayer at different times, upon the same mass of silver, are sufficient proofs of the uncertainty mentioned by M. Tillet. These variations are occasioned, according to that author, principally from the following causes: 1. From the inaccuracy of the balances and weights employed. 2. From the faulty fusion of the mass to be essayed; by which means the contained alloy may be unequally diffused. 3. From the impurity of the lead, especially from its containing silver, which is not always equally diffused through its mass. 4. From the different proportions of lead used by different essayers. 5. From the difference of the intensity of heat: for if the heat be not sufficiently intense, the silver will still contain a portion of alloy; and if the heat be too intense, too much of the silver will be imbibed by the cupel. 6. From the want of care in picking the small particles of silver, which frequently adhere to the sides of the cupel separately, from the principal button. 7. From the spurting which sometimes happens unobserved by the essayer; and which may further falsify the essays of other pieces included under the same muffle, by the falling of the particles thrown out of one cupel into others adjacent. But, with all the attentions to avoid these causes of error, the author obtained different results from different essays of the same mass of silver. Nor could he, by any method, make his different essays consistent with each other, but by adding to each button the particle extracted from the cupel; and this method he found by accurate experiments to be perfectly exact.

M. Tillet observed, that the quantity of lead directed in the regulations established in consequence of the report made by Messrs Macquer, Hellot, and Tillet, is not sufficient to purify the silver perfectly from its alloy. He nevertheless approves of the said regulation; and considers the weight of the alloy retained by the button, as some compensation for the weight of the silver absorbed by the cupel. And as it is a constant fact, that the more lead is used, the greater is the loss by the absorption of the cupel, he remarks, that a regulation, directing a larger proportion of lead for France than is used in other countries, would be disadvantageous to that kingdom; as thereby the silver of the same denomination would be required to be finer in that than in other countries where a less proportion of lead was employed. He observes, that the above mentioned rule, "that the more lead is used, the greater is the loss by the absorption of the cupel," does not extend to quantities of lead much above double the usual quantities. Thus 32 parts of lead to one of silver, will not occasion more absorption than 16 parts of

lead. For the refining scarcely takes place till the extraordinary quantity of lead be gone, and the silver is only or chiefly carried into the cupel along with the copper. Accordingly, he found, that he could render the silver finer by using four parts of lead at first, and afterwards adding two more parts when the irises began to appear, than by employing all the six parts of the lead at once. By this method of dividing the quantity of lead, the loss of silver by absorption was greater. M. Tillet did not find, that, by employing bismuth alone, or mixed with lead, his essays were more certain than when lead alone was used. He observed, however, that the addition of bismuth made the silver purer, but occasioned a greater absorption by the cupel.

2. *Essay of the Value of Gold.* The fictitious weights used to determine the purity of gold, and to essay this metal, are different from those of silver. See the preceding article. A mass of gold perfectly pure, or which contains no alloy, is ideally divided into 24 parts, called *carats*; this pure gold is therefore called *gold of 24 carats*. If the mass or ingot contains $\frac{1}{24}$ th part of its weight of alloy, the gold is then of 23 carats; and if it contains $\frac{2}{24}$ th or $\frac{1}{12}$ th of alloy, it is gold of 22 carats, &c. Hence we see, that the carat of gold is only a relative and proportional weight, so that the real weight of the carat varies according to the total weight of the mass of gold to be examined. If this mass of gold weighs a mark, the real weight of the carat will be $\frac{1}{24}$ th of eight ounces, which is equal to a mark. If the mass weigh an ounce, the carat will be $\frac{1}{24}$ th part of an ounce, or 24 grains. If it is only a penny-weight or 24 grains, the real weight of a carat will be one grain; and so on.

For greater accuracy, the carat of gold is divided into 32 parts, which are relative and proportional weights, as the carat itself is. Thus $\frac{1}{32}$ d of a carat of gold is $\frac{1}{32}$ d of $\frac{1}{24}$ th, or the $\frac{1}{768}$ th of any mass of gold: and the gold which contains an alloy equal to the $\frac{1}{768}$ th part of the whole mass is called *gold of 23 carats*, and $\frac{31}{32}$; gold which contains $\frac{2}{768}$ th of alloy is *gold of 23 carats* and $\frac{1}{16}$; and so on.

The real weight now generally used in the operation for determining the purity of gold is six grains. This weight then represents 24 carats. The half of this weight, or three real grains, represents 12 carats. According to this progression, we shall find that $\frac{1}{4}$ th of a real grain represents one carat, and the $\frac{1}{12}$ th part of a grain represents the $\frac{1}{32}$ d of a carat, or the $\frac{1}{768}$ th part of a mass of gold to be essayed.

As these weights are exceedingly small, some essayers employ a weight of 12 grains, which must be very convenient.

When a mass or ingot of gold is to be essayed, six grains are to be cut off, and exactly weighed: also 18 grains of fine silver are to be weighed. These two metals are to be cupelled together with about ten times as much lead as the weight of the gold. This cupellation is conducted precisely like that of the essay to determine the purity of the silver, excepting that the heat must be raised a little more towards the end of the operation when the essay is going to brighten. Then the gold is freed from all alloy but silver. If the quantity of copper or other alloy destructible by cupellation be required to be known, the remaining button is accurately weighed. The diminution of weight from the

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sum

Essay-hatch sum of the weights of the gold and of the silver determines the quantity of this alloy.

Essences.

* See Part.

The button containing gold and silver is then to be flattened upon a polished piece of steel, and care must be taken to anneal it from time to time, to prevent its splitting and cracking. By this method it is reduced to a thin plate, which is to be rolled up, in order to be parted by aquafortis*. The diminution found after the parting from the original weight of the gold essayed, shows the whole quantity of alloy contained in that gold.

The essay for determining the purity of gold is then made by two operations: the first, which is cupellation, deprives it of all its imperfect metals; and the second, which is parting, separates all the silver from it. By antimony also gold may be purified, which is a kind of dry parting. By this single operation, all the imperfect metals, and silver with which gold is alloyed, are separated. See PURIFICATION, GOLD, SILVER, REFINING.

Essay-Hatch, is the miners term for a little trench or hole, which they dig to search for shoad or ore.

ESSEDARII, a sort of gladiators, mentioned by Seneca, Suetonius, and Tully, who on some occasions engaged one another out of chariots called *essedæ*. The *essedum* was a sort of heavy chariot from which the Gauls and Britons engaged the Romans. See GLADIATOR.

ESSENCE, in metaphysics, that which constitutes the particular nature of each genus or kind, and distinguishes it from all others: being nothing but that abstract idea to which this name is affixed, so that every thing contained in it is essential to that particular kind.

This Mr Locke calls the *nominal essence*; in contradistinction to the real essence, or constitution of substances on which this nominal essence depends. Thus the nominal essence of gold is that complex idea the word *gold* stands for; let it be, for instance, a body, yellow, weighty, malleable, fusible, and fixed: but its real essence is the constitution of its insensible parts, on which these qualities and all its other properties depend, which is wholly unknown to us.

ESSENESES, or ESSENIANS, in Jewish antiquity, one of the three ancient sects among that people. They allowed a future state, but denied a resurrection from the dead. Their way of life was very singular: they did not marry; but adopted the children of others, whom they bred up in the institutions of their sect: they despised riches, and had all things in common, and never changed their cloaths till they were entirely worn out. When initiated, they were strictly bound not to communicate the mysteries of their sect to others; and if any of their members were found guilty of enormous crimes, they were expelled.

Pliny tells us, that they dwelt on the west side of the lake of Asphaltites; and that they were a solitary kind of men, living without women or money, and feeding upon the fruit of the palm-tree: he adds, that they were constantly recruited by new comers, whom the surges of ill fortune had made weary of the world; in which manner the sect was kept up for several thousands of years, without any being born among them. The reason why we find no mention made of them in the New Testament, may be their recluse and retired way of life, not less than their great simplicity

and honesty, whereby they lay open to no censure or reproof.

ESSENTIAL, something necessarily belonging to a thing, from which it cannot be conceived distinct: thus the primary qualities of bodies, as extension, figure, number, &c. are essential or inseparable from them in all their changes and alterations.

ESSENTIAL Oils are such as are really contained in a plant, and are drawn from it by distillation in an alembic with water: they are thus called, in contradistinction to empyreumatic oils, which are raised by a naked fire without water.

ESSEX, a county of England, bounded on the north by the Stour, which separates it from Suffolk and Cambridgeshire; on the east, by the German sea; on the west, by Hertfordshire and Middlesex; and on the south by the river Thames. It extends 46 miles in length from E. to W. and about 42 in breadth from N. to S. and 200 in circuit. This county is in the diocese of London, and gives title of Earl to the family of Capel. It is divided into 19 hundreds, and contains 27 market-towns, 415 parishes, 125 vicarages, and 1100 villages, with about 34,800 houses, and 208,800 inhabitants. It sends eight members to parliament; namely, two for the county, and two for Colchester, Harwich, and Malden. The air in the inland parts is healthy; but in the marshes near the sea it produces agues, particularly in the part called the Hundreds. However, the fertility of the unwholesome part is very great, and even the higher grounds of this county are very fruitful. About Saffron Walden, the earth, after bearing saffron three years, it is laid, will produce good barley for 18 years successively without any manure. Its produce, which is very plentiful, consists of corn, most excellent saffron, cattle, fowl, fish, and particularly oysters. The chief manufactures of this county are cloth, stuffs, and particularly baize. The principal rivers, besides the Thames, are the Stour, which falls into the German sea at Harwich; the Lea, its western boundary, falls into the Thames below Stratford; the Blackwater runs thro' the heart of the county, and passing by Chelmsford is joined by the Chalmers, and from thence runs into the German sea; the Coln runs by Halsted to Colchester, and so into the sea. The Roding which rises northwards, near Dunmow, runs into the Thames near Barking. All these rivers abound in most sorts of fish.

ESTATE, in law, signifies the title or interest that a person has in lands, tenements, or other effects; comprehending the whole in which a person hath any property, and will pass the same.

Estates are either real or personal; otherwise distinguished into FREEHOLDS, which descend to heirs; or CHATTELS, that go to executors or administrators.

A fee-simple is the amplest estate our law admits of. See FEE.

Estates are obtained several ways; as, by descent from a father to a son; by conveyance or grant from one person to another; by gift or purchase; or by deed or will. See DESCENT, SUCCESSION, TENURE, &c.

ESTATES, in a political sense, is used either to denote the dominions of some prince, or the general classes into which the people are divided.

In Britain, the estates are the king, lords, and commons;

Essential
Estate.

Esther
||
Estray.

mons; or rather the lords and commons, who meet the king in parliament, for reforming abuses, and enacting good and wholesome laws.

ESTHER, a canonical book of the Old Testament; containing the history of a Jewish virgin, dwelling with her uncle Mordecai at Shushan, in the reign of Ahasuerus, one of the kings of Persia.

The great beauty of this maid raised her to the throne of Persia; whereby she had an opportunity to save her countrymen, whose destruction was plotted by Haman, a favourite of that prince.

The learned are not agreed who this Ahasuerus was. Archbishop Usher supposes him to be Darius Hytaspes, and Artystona to be Esther. Scaliger makes him the same with Xerxes, and his queen Hanestris to be Esther. Josephus, on the contrary, positively asserts, that the Ahasuerus of the scriptures, is the Artaxerxes Longimanus of profane story; and the Septuagint, throughout the whole book of Esther, translate Ahasuerus by Artaxerxes. Most people subscribe to this last opinion; and indeed the extraordinary kindness showed by Artaxerxes to the Jews, can scarce be accounted for otherwise than by supposing that they had so powerful an advocate as Esther to solicit for them.

ESTOILE'E, or CROSS ESTOILE'E, in heraldry, a star with only four long rays in form of a cross; and, accordingly, broad in the centre, and terminating in sharp points.

ESTONIA, is a province of the Russian empire, and part of Livonia. It is bounded on the east by the Baltic sea, on the north by the Gulph of Finland, on the west by Ingria, and on the south by Lettonia. It is divided into six districts: 1. Harrien; 2. Wireland; 3. Alentakin; 4. Wich; 5. Jerven; and, 6. Odepoa. The principal towns are, Revel, Weisenberg, Borchholm, Narva, Nyssot, Habsal, Derpt, St Elin, Pernau, and Roderiwick.

In former times the inhabitants of this country carried on a good trade in corn, which was dried in stoves: but wars have much depopulated the country, insomuch that not a fourth part of it is inhabited, and a great number of gentlemens seats lie in ruins.

ESTOPPEL (formed of the French *estouper*, *opplare*, *obstipare*, "to stop, or block up"), in law, an impediment or bar of action, arising from a man's own act or deed; against which a man is forbidden, by law, to speak, though it be to say the truth.

ESTOVERS, in law, is used, by Bracton, for that sustenance which a man, committed for felony, is to have out of his lands or goods for himself and his family during imprisonment. In stat. 6 Edw. I. it is used for an allowance in meat or clothes. In some manors, the tenants have *common of Estovers*; that is, necessary botes or allowances out of the lord's wood: in which last sense, estovers comprehends house-bote, hay-bote, and plow-bote; so that if a man have in his grant these general words, *de rationabili estoverio in bos, &c.* he may thereby claim all three.

Estovers is also used for alimony, which, if the husband refuses to pay, there is, besides the ordinary process of excommunication, a writ at common-law, *de estoveriis habendis*, in order to recover it.

ESTRAY, or STRAY, signifies any tame beast, as sheep, oxen, swine, and horses, or swans, found within a lordship, and not owned by any man; in which

case being cried, according to law, in the church, and two market towns adjoining, if it be not claimed by the owner within a year and a day, it becomes the lord's of the soil where found. If the owner claims it within the year and day, he must pay the charges of finding, keeping, and proclaiming them; and he may seize it, without telling the marks or proving his property, which may be done at the trial if contested. If the beast stray within the year to another lordship, the first lord cannot retake it. An estray must be fed and kept, uninjured, and without labour, till it is reclaimed or the limited time expires.

ESTREAT, EXTRACTUM, in law, is used for the true copy or duplicate of some original writing, especially of amercements or penalties set down in the rolls of a court, to be levied by the bailiff or other officer, on every offender.

ESTREMADURA, a province of Spain, has New Castile on the east, Leon on the north, Andalusia on the south, and Portugal on the west. It is 175 miles in length, and 100 in breadth; and its principal towns are, Calatrava, Menda, and Badajoz, on the river Guadiana; Alcantara, on the Tajo; and Cona and Placentia, to the north of this river.

This province enjoys a very pure and healthful air, and its mountains are full of wild and tame animals; they having woods and forests for the one sort, and pastures for the other. The fields are planted with fruit-trees, which bear all kinds of delicious fruit. The vineyards produce excellent wines of all colours, and the fields yield plenty of corn.

ESTREMADURA, a province of Portugal, near the mouth of the Tagus or Tajo, bounded on the north by Beira, on the east and south by Alentejo, and on the west by the Atlantic Ocean. It is about 88 miles in length, and 45 in breadth. This province is divided into six comarcas, viz. Litria, Lisbon, Tomar, Santaren, and Alanquar, to the north of the Tagus; and that of Setubal, to the south of this river. These are likewise the principal towns. Estremadura is equal, if not preferable, to any other province in Spain or Portugal. The district of Santaren produces such plenty of corn, and feeds so many flocks of sheep, that it may enter into competition with Sicily. The fruits and the wines are all excellent; and it was here that the sweet oranges brought from China were first planted, and of which there are large quantities transported to foreign parts, with the wines and other fruits. The fields are covered with flowers almost all the year, from which the bees collect large quantities of fine honey. The olive-trees are numerous, from which they have excellent oil. The rivers abound with good fish, and the mountains have quarries of several kinds.

ETCHING, a method of engraving on copper, in which the lines or strokes, instead of being cut with a tool or graver, are eaten in with aquafortis. See ENGRAVING.

Etching is of a later invention, though not very modern, than engraving with the tool; of which it was at first only an imitation, that was practised by painters and other artists, who could much sooner form their hands to, and attain a faculty of, working in this way, than with the graver. But being then nevertheless considered as a counterfeit kind of engraving, and therefore inferior to the other, it was cultivated

Estreat
||
Etching.

Etching.

vated in a very confined manner; the closeness of the resemblance of the work to that performed by the tool, being made the test of its merit, and consequently the principal object of aim in those who pursued it. This servile confinement of the art of etching to the imitation of the original kind of engraving, was a great cause of retarding its advancement towards perfection, as many of the most able masters cramped their talents with the observance of it: which may be seen in the instances of Sadeler, Swaneberg, Villamena, and particularly Le Bosse; who, in his treatise on engraving, has laid down as a principle, that the perfection of this kind consists in the close similitude of the work with that done by the tool. This absurd prepossession has been since worn out: and the method of working with aquafortis has been so far improved, that instead of being now deemed a spurious kind of engraving, it evidently appears the foundation of an excellence in many modern works, that could never have been produced without it: since, though the neatness and uniformity of the hatches, which attend the use of the tool, is more advantageous with respect to portraits; yet the liberty and facility of the other manner give a much greater opportunity to exercise the force of genius and fancy in history-engraving; where the effect of the whole, and not the minute exactness in finishing all the parts, constitutes the principal value.

There are two methods practised of engraving in this way; the one with a hard varnish or ground, the other with a soft. The first was formerly much used, being better accommodated to the intention of imitating the engraving with the tool; as the firmness of the body of the varnish gave more opportunity of retouching the lines, or enlarging them with the oval-pointed needles, called by the French *échoppes*, as was practised by Le Bosse and others for that purpose. The latter has now almost wholly superseded the use of the other, by the free manner of working it admits of; which affords a power of expression incompatible with the greater inflexibility of the hard varnish, that confines the lines and hatches to such a regularity and sameness, as gives a stiffness of manner and coldness of effect to the work.

The mixture of the use of the tool and aquafortis, which are now both employed in many cases, has, however, given that perfection to engraving which it possesses at present. The truth and spirit of the outline that the method of working with aquafortis affords, and the variety of shades which the different kinds of black produce in this way, as well as other means of expressing the peculiar appearance and character of particular subjects, furnish what was defective in the sole use of the tool; while, on the other hand, the exactness and regularity of the lines, which are required for finishing many kinds of designs, are supplied by the graver; and by a judicious application of both, that complete finishing is obtained, which either of them alone must necessarily want.

The manner by which this art is performed, is the covering the surface of the plate with a proper varnish or ground, as it is called, which is capable of resisting aquafortis; and then scoring or scratching away, by instruments resembling needles, the parts of this varnish or ground, in the places where the strokes or hatches of the engraving are intended to be: then, the plate being covered with aquafortis, the parts

Etching. that are laid naked and exposed by removing the ground or varnish, are corroded or eaten away by it; while the rest, being secured and defended, remain untouched.

There are two methods of etching, as hath been already observed; the difference of which from each other consists, as well in the difference of the varnish or ground, as in that of the aquafortis, adapted to each kind; but the general methods of performing them are alike in both. These varnishes or grounds are distinguished by the names of *hard* and *soft*: for in their consistence, or the resistance they give to the needles, lies their essential variation from each other. The hard varnish, it is with good reason conjectured, was not the first in use: but soon took place of the other; and was, for some time, the most received in practice, on account of its admitting the work to be made more like that of the graver: the soft has, however, since, in its turn, prevailed to the exclusion of it in some degree, except in the case of particular subjects; but not so entirely as to take away the expedience of showing how it is performed. The manner of etching with the soft varnish is now, however, one of the most important objects of the art of engraving; and it is at present in universal use, sometimes alone, but more frequently intermixed with the work of the tool, and in some cases with great advantage, even where the whole is intended to pass for being performed by the graver.

Preparation of the soft varnish; according to Mr Lawrence, an eminent English engraver at Paris. "Take of virgin wax and asphaltum, each two ounces; of black pitch and Burgundy pitch, each half an ounce. Melt the wax and pitch in a new earthen-ware glazed pot; and add to them, by degrees, the asphaltum finely powdered. Let the whole boil till such time as that, taking a drop upon a plate, it will break when it is cold, on bending it double two or three times betwixt the fingers. The varnish being then enough boiled, must be taken off the fire; and letting it cool a little, must be poured into warm water, that it may work the more easily with the hands, so as to be formed into balls; which must be rolled up, and put into a piece of taffety for use."

It must be observed, first, that the fire be not too violent, for fear of burning the ingredients; a slight simmering will be sufficient: secondly, that while the asphaltum is putting in, and even after it is mixed with them, the ingredients should be stirred continually with the spatula; and thirdly, that the water, into which this composition is thrown, should be nearly of the same degree of warmth with it, to prevent a kind of cracking that happens when the water is too cold.

The varnish ought always to be harder in summer than in winter; and it will become so if it be suffered to boil longer, or if a greater proportion of the asphaltum or brown resin be used. The experiment above-mentioned, of the drop suffered to cool, will determine the degree of hardness or softness that may be suitable to the season when it is used.

Preparation of the hard varnish used by Callot, commonly called the Florence varnish. Take four ounces of fat oil very clear, and made of good linseed oil, like that used by painters: heat it in a clean pot of glazed earthen

Etching. earthen-ware, and afterwards put to it four ounces of mastich well powdered; and stir the mixture briskly till the whole be well melted; then pass the whole mass through a piece of fine linen into a glass bottle with a long neck, that can be stopped very securely; and keep it for the use that will be below explained.

Method of applying the soft varnish to the plate, and of blackening it. The plate being well polished and burnished, as also cleansed from all greasiness by chalk or Spanish white, fix a hand-vice on the edge of the plate where no work is intended to be, to serve as a handle for managing it when warm: then put it upon a chafing-dish, in which there is a moderate fire; observing to hold it so that it may not burn: keep the plate over the fire till it be so hot that the varnish being brought into contact with it may melt: then cover the whole plate equally with a thin coat of the varnish; and while the plate is warm, and the varnish upon it in a fluid state, beat every part of the varnish gently with a small ball or dauber made of cotton tied up in taffety; which operation smooths and distributes the varnish equally over the plate.

When the plate is thus uniformly and thinly covered with the varnish, it must be blackened by a piece of flambeau, or of a large candle which affords a copious smoke; sometimes two, or even four, such candles are used together for the sake of dispatch, that the varnish may not grow cold: which if it does during the operation, the plate must then be heated again, that it may be in a melted state when that operation is performed: but great care must be taken not to burn it; which, when it happens, may be easily perceived by the varnish appearing burnt and losing its gloss. The following expedient is made use of for the more commodiously blackening the varnish, being particularly necessary where the plates are large: Fix a strong hook in the roof of the room, through which pass four pieces of cord of equal length, at the end of which are fixed four iron rings of about four inches diameter, for supporting the corners of the plate. The plate being thus suspended in the air, with the varnished side downwards, may be blackened with great convenience: but this is not, however, absolutely requisite, except in the case of large plates that could not, without difficulty, be held up, unless this or some other such contrivance were made use of.

It is proper to be very cautious in keeping the flambeau or candle at a due distance from the plate, lest the wick touch the varnish, which would both sully and mark it. If it appear that the smoke has not penetrated the varnish, the plate must be again placed for some little time over the chafing-dish; and it will be found, that, in proportion as the plate grows hot, the varnish will melt and incorporate with the black which lay above it, in such a manner that the whole will be equally pervaded by it.

Above all things, the greatest caution should be used in this operation, to keep all the time a moderate fire; and to move frequently the plate, and change the place of all the parts of it, that the varnish may be alike melted every where, and kept from burning. Care must also be taken, that during this time, and even till the varnish be entirely cold, no filth, sparks, or dust, fly on it; for they would then stick fast, and spoil the work.

Method of applying the hard varnish. This is precisely

the same as for the soft; being spread equally over the warm plate with the taffety-ball, and smoked in the same manner: only after it is smoked, it must be baked, or dried over a gentle fire of charcoal, till the smoke from the varnish begins to decrease; taking care not to over-heat the plate, which would both soften it and burn the varnish.

The plate being thus prepared, and an exact drawing of the outlines of the design made upon thin paper, the other side of the paper must be well rubbed with chalk or Spanish whitening, or, which is better, with red chalk scraped to a powder; and the loose chalk is cleared off with a linen rag: then the stained side of the paper is laid upon the varnish, fixing the corners to the plate with wax or wafers, to prevent its shuffling; and with a blunted needle or pointer the drawing is slightly traced, and communicates to the varnish an exact outline of the design to be etched.

A variety of pointers is necessary for the work. Those used for the broad large strokes ought to be very blunt, exceeding round, and well polished at the point; the foal of a shoe answers very well for polishing the points. The finest ought to be as sharp as a needle. If any scratches or false strokes happen in the working, they are to be stopped up with a hair-pencil dipped in Venetian varnish, mixed with lamp-black, by which means these places will be defended from the action of the aquafortis.

The next operation is that of eating or corroding the plate with aquafortis; in order to which, a border of soft wax (being a composition of bees-wax melted and tempered with a little Venice turpentine and tallow) must be fastened round the plate about an inch high, in the form of a little wall or rampart, to contain the aquafortis. At one of the corners of this border a gutter is usually made, which serves for pouring commodiously the aquafortis off the plate. The plate being thus bordered, take a due quantity of the refiners aquafortis; mix it with half its quantity of common water; and pour it gently on, till it rise above a finger's breadth above the surface of the plate; when, if all things have been rightly conducted, it will be seen that the aquafortis will soon exert its action in the hatches which have been strongly touched; but those more weakly engraved will appear at first clear, and of the colour of the copper. The menstruum must therefore be suffered to continue on the plate till its effects become visible on the more tender parts: then the aquafortis should be poured off, the plate washed with clean water, and dried before the fire: then take a small pencil dipped into the Venetian varnish, and cover with it the lighter parts of the plate. This being done, the aquafortis must again be poured on, and suffered to continue a longer or shorter time, according to the strength of the menstruum, or the nature of the engraving; when it must be again poured off as before, and the plate immediately washed with water.

It may not be improper to observe, that, when the aquafortis is on the plate, a feather should be used to cleanse away the foulness of the verdigris that gathers in the hatches when the aquafortis operates on them, and to give it more room to exert its action; for by moving the aquafortis to and fro on the plate by the feather, and brushing away the black saline matter where it appears to be formed, the hatches will be cleansed,

Eteocles
||
Etefiae.

cleansed, and the aquafortis exert its whole force equally on every part.

The plate being thus sufficiently corroded by the aquafortis, and well washed with water, it must be warmed at the fire, and the border of wax removed; after which, it must be made hotter till the varnish melt; then it must be well wiped with a linen cloth, and afterwards rubbed heartily with oil of olives; when it will be ready to be retouched and finished by the graver. See the article ENGRAVING.

ETEOCLES (fab. hist.), a son of Œdipus and Jocasta. After his father's death, it was agreed between him and his brother Polynices, that they should both share the royalty, and reign alternately each a year. Eteocles by right of seniority first ascended the throne; but after the first year of his reign was expired he refused to give up the crown to his brother, according to their mutual agreement. Polynices, resolved to punish such an open violation of a solemn engagement, went to implore the assistance of Adrastus king of Argos. He received that king's daughter in marriage, and was soon after assisted with a strong army headed by seven famous generals. These hostile preparations were seen by Eteocles, who on his part did not remain inactive. He chose seven brave chiefs to oppose the seven leaders of the Argives, and stationed them at the seven gates of the city. He placed himself against his brother Polynices, and he opposed Menalippus to Tydeus, Polyphontes to Capaneus, Megareus to Eteocles, Hyperbius to Parthenopæus, and Læsthenes to Amphiaræus. Much blood was shed in light and unavailing skirmishes, and it was at last agreed between the two brothers that the war should be decided by single combat. They both fell in an engagement conducted with the most inveterate fury on either side; and it is even said that the ashes of these two brothers, who had been so inimical one to the other, separated themselves on the burning pile, as if sensible of resentment, and hostile to reconciliation.

ETERNITY, an attribute of God, expressing his infinite or endless duration. See LOGIC and METAPHYSICS.

ETERNITY, in mythology, a divinity among the Romans, who had neither temples nor altars. They represented it under the figure of a woman, who held the sun in one hand and the moon in the other: her symbols were a phoenix, globe, and elephant.

ETESIAE, or ETESIAN winds, are such as blow at stated times of the year, from what part soever of the compass they come. They are so called from the Greek word *etês*, "year," being yearly or anniversary winds, such as our seamen call *monsoons* and *trade-winds*, which in some parts of the world continue constantly blowing for certain stated seasons of the year. Thus, the north winds, which, during the dog-days, constantly blow upon the coasts of Egypt, and hinder all ships from sailing out of Alexandria for that season, are called *etesiae* in Cæsar's Commentaries. In other authors, the west and east winds are called *etesiae*, when they continue blowing for certain seasons of the year.

Cellarius endeavours to prove that those winds are properly etesian which blow from that part of the horizon which is between the north and west about the time of the solstice. In ancient writers, they are represented as of a very mild and gentle nature; and were cal-

led by mariners *somniculosi* and *delicati*, from their sleeping or ceasing to blow in the night.

ETHELBALD,
ETHELBERT,
ETHELRED,
ETHELWOLF,
ETHER,
ETHERIAL,

} kings of
England.

See
(History of)
ENGLAND.

} See ÆTHER.

ETHERIDGE (Sir George), a celebrated wit and comic genius in the reigns of Charles II. and James II. descended from an ancient family in Oxfordshire, and born in 1636. He travelled in his youth; and, not being able to confine himself to the study of the law, devoted himself to the gayer accomplishments. His first dramatic performance, the Comical Revenge, or Love in a Tub, appeared in 1664, and introduced him to the leading wits of the time: in 1668, he produced a comedy called She would if she could; and, in 1676, he published his last comedy, called the Man of Mode, or Sir Fopling Flutter; which is perhaps the most elegant comedy, and contains more of the real manners of high life than any one the English stage was ever adorned with. This piece he dedicated to the beautiful duchess of York, in whose service he then was; and who had so high a regard for him, that when, on the accession of James II. she came to be queen, she procured his being sent ambassador first to Hamburg, and afterwards to Ratisbon, where he continued till after his majesty quitted the kingdom. Our author being addicted to certain gay extravagances, had greatly impaired his fortune; to repair which, he paid his addresses to a rich widow: but she, being an ambitious woman, had determined not to condescend to a marriage with any man who could not bestow a title upon her; on which account he was obliged to purchase a knighthood. None of the writers have exactly fixed the period of Sir George's death, though all seem to place it not long after the Revolution. Some say, that on this event he followed his master king James into France, and died there; but the authors of the Biographia Britannica mention a report, that he came to an untimely death by an unlucky accident at Ratisbon; for that after having treated some company with a liberal entertainment at his house there, where he had taken his glass too freely, and being, through his great complaisance, too forward in waiting on his guests at their departure, flushed as he was, he tumbled down stairs and broke his neck, and so fell a martyr to mirth and jollity. As to Sir George's literary character, he certainly was born a poet, and seems to have been possessed of a genius whose vivacity needed no cultivation: for we have no proofs of his having been a scholar. His works, however, have not escaped censure on account of that licentiousness which in general runs through them, which renders them dangerous to young unguarded minds; and the more so, for the lively and genuine wit with which it is gilded over, and which has therefore justly banished them from the purity of the present stage.

ETHICS, the doctrine of manners, or the science of moral philosophy. The word is formed from *êthos*, "mores," "manners;" by reason the scope or object thereof is to form the manners. See MORAL PHILOSOPHY.

ETHIOPIA, a celebrated, though very much unknown.

Ethelbald
||
Ethiopia.

¹ **Ethiopia.** known empire of Africa, whose boundaries have never been exactly defined either by ancient or modern geographers. By some writers of antiquity the title of *Ethiopians* was given to all nations whose complexion was black: hence we find the Arabians as well as many other Asiatics sometimes falling under this denomination; besides a number of Africans whose country lay at a distance from Ethiopia properly so called. Thus the Africans in general were by these writers divided into the western or Hesperian Ethiopians, and those above Egypt situated to the east of the former; the latter being much more generally known than the former, by reason of the commerce they carried on with the Egyptians.

² **Different names of Ethiopia.**

From this account we may easily understand why there should be such a seeming disagreement among ancient authors concerning the situation of the empire of Ethiopia, and likewise why it should pass under such a variety of names. Sometimes, for example, it was named *India*, and the inhabitants *Indians*; an appellation likewise applied to many other distant nations. It was also denominated *Atlantia* and *Etheria*, and in the most remote periods of antiquity *Cephenia*; but more usually *Abasene*, a word somewhat resembling *Abassia* or *Abyssinia*, two of its modern names. On the other hand, we find Persia, Chaldaea, Assyria, &c. styled *Ethiopia* by certain writers; and all the countries extending along the coasts of the Red Sea were promiscuously denominated *India* and *Ethiopia*. By the Jews the empire of Ethiopia was styled *Cush* and *Ludim*.

³ **Situation of Ethiopia Propria.**

Notwithstanding this diversity of appellations, and vast diffusion of territory ascribed to the Ethiopians, there was one country to which the title was thought more properly to belong than to any of the rest; and which was therefore called *Ethiopia Propria*. This was bounded on the north by Egypt, extending all the way to the lesser cataract of the Nile, and an island named *Elephantine*; on the west it had Libya Interior; on the east the Red Sea, and on the south unknown parts of Africa; though these boundaries cannot be fixed with any kind of precision.

⁴ **Different nations in Ethiopia.**

In this country the ancients distinguished a great variety of different nations, to whom they gave names either from some personal property, or from their manner of living. The principal of these were, 1. The *Blemmyes*, seated near the borders of Egypt; and who, probably from the shortness of their necks, were said to have no heads, but eyes, mouths, &c. in their breasts. Their form, somehow or other, must have been very extraordinary, as we learn from Vopiscus, who gives an account of some of the captives of this nation brought to Rome. 2. The *Nobatae*, inhabiting the banks of the Nile near the island Elephantine already mentioned, said to have been removed thither by Oasis to repress the incursions of the Blemmyes. 3. The *Troglydytes*, by some writers said to belong to Egypt, and described as little superior to brutes. 4. The *Nubians*, of whom little more is known than their name. 5. The *Pigmies*, by some supposed to be a tribe of Troglydytes; but by the most approved writers placed on the African coast of the Red Sea. 6. The *Aualia* or *Abalita*, of which we know nothing more than that they were situated near the Abalitic gulf. 7. The *Struthiophagi*, so called from their feeding upon ostriches, were situated to the south of the Memnonnes. 8. The *Acridophagi*; 9. *Chelonophagi*; 10. *Ichthyophagi*; 11. *Cynamol-*

Ethiopia. *gi*; 12. *Elephantophagi*; 13. *Rhizophagi*; 14. *Spermaphagi*; 15. *Hylophagi*; and, 16. *Ophiophagi*: all of whom had their names from the food they made use of, viz. locusts, tortoises, fish, bitches milk, elephants; roots, fruits, or seeds, and serpents. 17. The *Hylogones*, neighbours to the Elephantophagi, and who were so savage that they had no houses, nor any other places to sleep in but the tops of trees. 18. The *Pamphugi*, who used almost every thing indiscriminately for food. 19. The *Agriophagi*, who lived on the flesh of wild beasts. 20. The *Anthropophagi*, or man-eaters, are now supposed to have been the Caffres, and not any inhabitants of Proper Ethiopia. 21. The *Hippophagi*, or horse-eaters, who lay to the northward of Libya Incognita. 22. The *Macrobii*, a powerful nation, remarkable for their longevity; some of them attaining the age of 120 years. 23. The *Sambri*, situated near the city of Genuphis in Nubia upon the Nile; of whom it is reported that all the quadrupeds they had, not excepting even the elephants, were destitute of ears. 24. The *Asacha*, a people inhabiting the mountainous parts, and continually employed in hunting elephants. Besides these, there were a number of other nations or tribes, of whom we scarce know any thing but the names; as the Gapachi, Ptoemphanes, Catadupi, Pechini, Catadræ, &c.

⁵ In a country inhabited by such a variety of nations, Of the first all in a state of extreme barbarism, it is rather to be wondered that we have any history at all, than that it is not more distinct. It has already been observed, that the Jews, from the authority of the sacred writers no doubt, bestowed the name of *Cush* upon the empire of Ethiopia; and it is generally agreed that Cush was the great progenitor of the inhabitants. In some passages of scripture, however, it would seem that *Cush* was an appellation bestowed upon the whole peninsula of Arabia, or at least the greater part of it. In others, the word seems to denominate the country watered by the Araxes, the seat of the ancient Scythians or Cuthites; and sometimes the country adjacent to Egypt on the coast of the Red Sea.

⁶ A number of authors are of opinion, that Ethiopia received its first inhabitants from the country lying to the east of the Red Sea. According to them, the descendants of Cush, having settled in Arabia, gradually migrated to the south-eastern extremity of that country; whence, by an easy passage across the straits of Babelmandel, they transported themselves to the African side, and entered the country properly called *Ethiopia*: a migration which, according to Eusebius, took place during the residence of the Israelites in Egypt; but, in the opinion of Syncellus, after they had taken possession of Canaan, and were governed by judges. Mr Bruce makes mention of a tradition among the Abyssinians, which, they say, has existed among them from time immemorial, that very soon after the flood, Cush the grandson of Noah, with his family, passed through Atbara, then without inhabitants, till they came to the ridge of mountains which separates that country from the high lands of Abyssinia. Here, still terrified with the thoughts of the deluge, and apprehensive of a return of the same calamity, they chose to dwell in caves made in the sides of these mountains, rather than trust themselves in the plains of Atbara;

Ethiopia.

8
Original
habitations
of the
Cushites.

bara; and our author is of opinion, that the tropical rains, which they could not fail to meet with in their journey southward, and which would appear like the return of the deluge, might induce them to take up their habitations in these high places. Be this as it will, he informs us that it is an undoubted fact, "that here the Cushites, with unparalleled industry, and with instruments utterly unknown to us, formed to themselves commodious, yet wonderful, habitations in the heart of mountains of granite and marble, which remain entire in great numbers to this day, and promise to do so till the consummation of all things."

9
Description
of the city
of Axum.

The Cushites having once established themselves among these mountains, continued to form habitations of the like kind in all the neighbouring ones; and thus following the different chains (for they never chose to descend into the low country), spread the arts and sciences, which they cultivated, quite across the African continent from the eastern to the western ocean. According to the tradition above-mentioned, they built the city of Axum early in the days of Abraham. This, though now an inconsiderable village, was anciently noted for its superb structures, of which some remains are still visible. Among these are some belonging to a magnificent temple, originally 110 feet in length, and having two wings on each side; a double porch; and an ascent of 12 steps. Behind this stand several obelisks of different sizes, with the remains of several others which have been destroyed by the Turks. There is also a great square stone with an inscription, but so much effaced that nothing can be discovered excepting some Greek and Latin letters, and the word *Basilus*. Mr Bruce mentions some "prodigious fragments of colossal statues of the dog-star" still to be seen at this place; "and *Seir* (adds he), which, in the language of the Troglodytes, and in that of the low country of Meroe, exactly corresponding to it, signifies a dog, instructs us in the reason why this province was called *Sirè*, and the large river which bounds it *Siris*."

10
Meroe why
founded.

Soon after building the city of Axum, the Cushites founded that of Meroe, the capital of a large island or peninsula formed by the Nile, much mentioned by ancient historians, and where, according to Herodotus, they pursued the study of astronomy in very early ages with great success. Mr Bruce gives two reasons for their building this city in the low country after having built Axum in the mountainous part of Abyssinia. 1. They had discovered some inconveniences in their caves both in *Sirè* and the country below it, arising from the tropical rains in which they were now involved, and which prevented them from making the celestial observations to which they were so much addicted. 2. It is probable that they built this city farther from the mountains than they could have wished, in order to avoid the fly with which the southern parts were infested.

11
Description
of a pesti-
lential fly.

This animal, according to Mr Bruce, who has given a figure of it, is the most troublesome to quadrupeds that can be imagined. He informs us, that it infests those places within the tropical rains where the soil is black and loamy, and no other place whatever. It is named *Zimb* (by whom we are not informed), and has not been described by any other naturalist. It is of a size somewhat larger than a bee, thicker in proportion, and having broader wings, placed separate like those of a fly, and quite colourless, or without any spots. The head

is large, with a sharp upper jaw; at the end of which is a strong pointed hair about a quarter of an inch long; and the lower jaw has two of these hairs: all of which together make a resistance to the finger equal to that of a strong hog's bristle. One or all of these hairs are used as weapons of offence to the cattle; but what purpose they answer to the animal itself, our author does not say. So intolerable, however, are its attacks to the cattle, that they no sooner hear its buzzing, than they forsake their food, and run about till they fall down with fright, fatigue, and hunger. Even the camel, though defended by a thick and strong skin with long hair, cannot resist the punctures of this insect; which seem to be poisonous, as they produce large putrid swellings on the body, head, and legs, which at last terminate in death. To avoid this dreadful enemy, the cattle must all be removed as quick as possible to the sandy parts of Atbara, where they stay as long as the rains last, and where this dreadful enemy never ventures to follow them. The elephant and rhinoceros, who, on account of the quantity of food they require, cannot remove to these barren places, roll themselves in the mud, which, when dry, coats them over so hard, that they are enabled to resist the punctures of the insect; though even on these some tubercles are generally to be met with, which our author attributes to this cause. Mr Bruce is of opinion, that this is the fly mentioned by Isaiah, chap. vii. 18. 19. "And it shall come to pass, in that day, that the Lord shall hiss for the fly that is in the uttermost part of the rivers of Egypt; and they shall come and shall rest all of them in the desolate valleys, and in the holes of the rocks, and upon all thorns, and upon all bushes." "That is (says Mr Bruce), they shall cut off from the cattle their usual retreat to the desert, by taking possession of these places, and meeting them there, where ordinarily they never come, and which therefore are the refuge of the cattle."

Meroe, which lay in N. Lat. 16°, the exact limit of the tropical rains, was without the bounds assigned by nature to these destructive insects; and consequently a place of refuge for the cattle. Mr Bruce, on his return through the desert, saw at Gerri, in this latitude, ruins, supposed to be those of Meroe, and caves in the mountains immediately above them; for he is of opinion, that they did not abandon their caverns immediately after they began to build cities. As a proof of this, he mentions that Thebes, in Upper Egypt, was built by a colony of Ethiopians; and that near the ruins of that city, a vast number of caves are to be seen even up to the top of a mountain in the neighbourhood: all of which are inhabited at this day. By degrees, however, they began to exchange these subterranean habitations for the cities they built above ground; and thus became farmers, artificers, &c. though originally their sole employment had been commerce.

On this subject Mr Bruce has given a very curious dissertation; though how far the application of it to the Ethiopians may be just, we cannot pretend to determine. He begins with observing, that the magnificence of the Indians and Egyptians has been celebrated from the most remote antiquity, without any account of the sources from whence all this wealth was derived: and indeed it must be owned, that in all histories of these people, there is a strange deficiency in this respect. The kings, we are to suppose, derived their

Ethiopia.

12
Of the
magnifi-
cence of
the ancient
Indians and
Egyptians.

Ethiopia.

splendor and magnificence from their subjects; but we are quite at a loss to know whence their subjects had it: and this seems the more strange, that in no period of their history are they ever represented in a poor or mean situation. Nor is this difficulty confined to these nations alone. Palestine, a country producing neither silver nor gold, is represented by the sacred writers as abounding in the early ages with both those metals in a much greater proportion than the most powerful European states can boast of, notwithstanding the vast supplies they derive from the lately discovered continent of America. The Assyrian empire, in the time of Semiramis, was so noted for its wealth, that M. Montesquieu supposes it to have been obtained by the conquest of some more ancient and richer nation; the spoils of which enriched the Assyrians, as those of the latter afterwards did the Medes. This, however, Mr Bruce very justly observes, will not remove the difficulty, because we are equally at a loss to know whence the wealth was derived to that former nation; and it is very unusual to find an empire or kingdom of any extent enriched by conquest. The kingdom of Macedon, for instance, though Alexander the Great over-ran and plundered in a very short time the richest empire in the world, could never vie with the wealth of Tyre and Sidon. These last were commercial cities; and our author justly considers commerce as the only source from whence the wealth of a large kingdom ever was or could be derived. The riches of Semiramis, therefore, were accumulated by the East India trade centring for some time in her capital. While this was suffered to remain undisturbed, the empire flourished: but by an absurd expedition against India itself, in order to become mistress at once of all the wealth it contained, she lost that which she really possessed; and her empire was soon after entirely ruined. To the same source he attributes the riches of the ancient Egyptians; and is of opinion, that Sesostris opened up to Egypt the commerce with India by sea; though other authors speak of that monarch in very different terms. As the luxuries of India have some how or other become the objects of desire to every nation in the world, this easily accounts for the wealth for which Egypt has in all ages been so much celebrated, as well as for that with which other countries abounded; while they served as a medium for transmitting these luxuries to other nations, and especially for the riches of those which naturally produced the Indian commodities so much fought after. This was the case particularly with Arabia, some of the productions of which were very much coveted by the western nations; and being, besides, the medium of communication between the East Indies and western nations, it is easy to see why the Arabian merchants soon became possessed of immense wealth.

Besides the territories already mentioned, the Cushites had extended themselves along the mountains which run parallel to the Red Sea on the African side; which country, according to Mr Bruce, has "in all times been called *Saba*, or *Azabo*, both which signify *South*;" an epithet given from its lying to the southward of the Arabian gulf, and which in ancient times was one of the richest and most important countries in the world. "By that acquisition (says our author), they enjoyed all the perfumes and aromatics in the east; myrrh, and frankincense, and cassia; all which

grow spontaneously in that stripe of ground from the Bay of Bilur west of Azab to Cape Gardafan, and then southward up in the Indian ocean, to near the coast of Melinda, where there is cinnamon, but of an inferior kind." As the Cushites or Troglodytes advanced still farther south, they met not only with mountains, in which they might excavate proper habitations, but likewise with great quantities of gold and silver furnished by the mines of Sofala, which, our author says, furnished "large quantities of both metals in their pure and unmixed state, lying in globules without any alloy or any necessity of preparation or separation." In other parts of his work, he labours to prove Sofala to have been the *Ophir* mentioned in scripture.

Thus the Ethiopians, for some time after their settlement, according to Mr Bruce, must have been a nation of the first importance in the world. The northern colonies from Meroe to Thebes built cities, and made improvements in architecture; cultivated commerce, agriculture, and the arts; not forgetting the science of astronomy, for which they had an excellent opportunity by reason of the clearness of the sky in the Thebaid. Their brethren farther to the south, or those who inhabited Ethiopia properly so called, were confined for six months to their caves by reason of the tropical rains, whence they were naturally led to pursuits of another kind. "Letters*, at least one kind of them, and arithmetical characters (we are told), were invented by this middle part of the Cushites; while trade and astronomy, the natural history of the winds and seasons, were what necessarily employed that part of the colony established at Sofala most to the southward."

While the Cushites were thus employed at home in collecting gold, gathering and preparing spices, &c. these commodities were sent abroad into other countries by another set of people named *Shepherds*, who acted as carriers to them, and who afterwards proved so formidable to the Egyptians†. These differed in their appearance from the Ethiopians, having long hair, and the features of Europeans; and were of a very dark complexion, though not at all like the blackmoors or negroes. They lived in the plain country in huts or moveable habitations, attending their cattle, and wandering up and down as various circumstances required. By acting as carriers to the Cushites, they became a great and powerful people, possessing vast numbers of cattle, as well as a very considerable extent of territory. They possessed a stripe of land along the Indian ocean; and to the northward of that, another along the Red-Sea: but their principal habitation was the flat part of Africa between the northern tropic and the mountains of Abyssinia, which country is now called *Beja*. This reaches from Masuah along the sea-coast to Suakem; then turns westward, and continues in that direction, having the Nile on the south, the tropic of Cancer on the north, with the deserts of Selima and Libya on the west. The next district belonging to these people was Meroe, now called *Atbara*, lying between the rivers Nile and Atbaras. A third district, now called *Derkin*, is a small plain lying between the river Mareb on the east and Atbara on the west. But the most noble and warlike of all the Shepherds were those who possessed the mountains

13

The Ethiopians at first a civilized and learned people.

* Bruce's Travels, l. p. 383.

14

Account of the Ethiopian Shepherds.

† See E. gyp. n° 2.

Ethiopia. mountains of Habab, reaching from the neighbourhood of Masuah to Suakem; which district is still inhabited by them.

15
Different
classes of
them.

These Shepherds, according to our author, were distinguished by several different appellations, which may be supposed to denote different degrees of rank among them. Those called simply *Shepherds*, our author supposes to have been the common sort who attended the flocks. Another set were called *Hycfos* or *Agfos*, signifying "armed shepherds," who are supposed to have been the soldiers. A third were named *Agag*, supposed to be the chiefs or nobles of these armed shepherds; whence the title of *king of kings*, according to Mr Bruce, is derived; and he supposes *Agag* killed by Samuel, to have been an Arabian shepherd.

16
Reason of
the enmity
between
the Shep-
herds and
Egyptians.

The building of Carthage augmented the power of the Shepherds to a considerable degree, by reason of the vast quantity of carriage naturally belonging to a place of such extensive commerce, and which fell into the hands of the Lehabim, Lubim, or Libyan peasants. An immense multitude of camels, in the early ages, answered the purpose of navigation: and thus we find that commerce was carried on by the Ishmaelites as early as the days of Joseph from the southern extremity of the Arabian peninsula. These Shepherds, however, though generally the friends and allies of the Egyptians, who were also Cushites, sometimes proved very bitter enemies to them, as is related in the history of that country. The reason of this may be deduced from the great opposition betwixt their manners and customs. The Egyptians worshipped black cattle, which the Shepherds killed and used as food; the latter worshipped the heavenly bodies, while the Egyptians were the grossest idolaters, and worshipped idols of all kinds that can be imagined. Hence a mere difference in religion might occasion many bloody quarrels; though if the above account can be depended upon as authentic, it is natural to imagine that the mutual connection of interest should have cemented their friendship, whatever difference there might happen to be in opinions of any kind.

17
Origin of
the differ-
ent Ethio-
pian na-
tions.

Besides the Cushites and Shepherds, however, we must now seek for the origin of those different nations which have already been mentioned. Mr Bruce allows that there are various nations inhabiting this country, who are fairer than either the Cushites or the Shepherds, and which, though they have each a particular name, are all known by the general title of *Habesk*: which may be translated by the Latin word *convena*, signifying a number of distinct people meeting accidentally in one place; and which our author maintains against Scaliger, Ludolf, and a number of others, to be a very just translation, and exceedingly consonant to the history of the country.

18
First settle-
ment of E-
thiopia, ac-
cording to
the Abyssi-
nian hi-
story.

The most authentic ancient history of this country, according to Mr Bruce, is the chronicle of Axum: the character of which, among the modern Abyssinians, stands next to the sacred writings themselves; and consequently must be esteemed the highest Abyssinian authority we have on the subject. According to this book, there was an interval of 5500 years between the creation of the world and the birth of Christ; 1808 years before which last event the empire of Abyssinia or Ethiopia received its first inhabitants. Two hundred years after its settlement, it was so de-

stroyed by a flood that it received the name of *Oure Midra*, or a country laid waste; "or (says our author) as it is called in scripture itself, *a land which the waters or floods had spoiled*," (Isaiah xviii. 2.) The peopling of the country was finished about 1400 years before Christ, by the settlement of a great number of people, speaking different languages, who sat down peaceably in the high lands of Tigre, in the neighbourhood of the Shepherds, with whom they were in friendship. These people, according to tradition, came from Palestine; and our author is inclined to believe the whole of the relation to be true, as the time coincides with the expulsion of the Canaanitish nations by Joshua, which happened about 1490 B. C. ten years before which there had been, according to Pausanias, a flood in Ethiopia which occasioned prodigious devastation. Ethiopia, he thinks, would afford the most ready asylum for the fugitive Canaanites, as they must have long had a commercial intercourse with that country; and he supports the opinion likewise from what Procopius mentions of two pillars extant in his time, on the coast of Mauritania, with the following inscription in the Phœnician language: "We are Canaanites, flying from the face of Joshua, the son of Nun, the robber." The authenticity of these inscriptions, however, is much disputed, and therefore it cannot go a great way in establishing any historical point. The first and most considerable of the colonies above mentioned settled in the province of Amhara; the second in Damot, one of the southern provinces; the third in another province called *Lasta*, or *Tcheratz-Agow*, from *Tchera* their principal habitation; and a fourth in the territory of Gafat.

Our author goes on to prove, that the Ethiopians in ancient times were not only the most learned people in the world, but that they spoke the original language, and were the inventors of writing. In what manner they came to degenerate from this character, and into their present state of barbarity, cannot be known; this being a phenomenon equally unaccountable with the degeneracy of the Egyptians. According to some authors, the Ethiopians were conquered by Moses: of which transaction we have the following account. Before the time of that legislator, the Ethiopians possessed the country of Thebais in Egypt: but, not content with this, they made an irruption into the Lower Egypt, and penetrated as far as Memphis; where, having defeated the Egyptians, they threatened the kingdom with total destruction. The Egyptians, by the advice of their oracles, put Moses at the head of their forces; who immediately prepared for invading the enemy's country. The Ethiopians imagined that he would march along the banks of the Nile; but Moses chose rather to pass through some of the interior countries, though greatly infested with serpents, and where consequently his march must be attended with much danger. To preserve his men, he constructed a number of chests or panniers of the Egyptian reed papyrus, which he filled with the birds named *Ibis*, celebrated for their antipathy to serpents. As soon as he approached the tract abounding with these reptiles, a sufficient number of the birds were let out, who presently cleared the way for the army by destroying the serpents. Thus the Ethiopians were surprised in their own country where they had

Ethiopia.
19
The coun-
try laid
waste by a
deluge.

20
Ethiopia
conquered
by Moses.

Ethiopia.

dreaded no invasion; their forces, being defeated in the field, were at last shut up in the capital Meroe, a city almost impregnable, by being surrounded with three rivers, the Nile, Astapus, and Astaboras. The daughter of the Ethiopian monarch, however, having an opportunity of seeing Moses from the walls, fell in love with him, and offered to deliver up the city, provided he would swear to marry her. With this requisition the Jewish legislator complied; but treated the inhabitants with great severity, plundering the city, and putting many of the inhabitants to death. After this he ravaged the whole country, dismantling all the places of strength; and having thus rendered the Ethiopians incapable of attempting any thing against other nations for a considerable time, he returned in triumph to Egypt, after an absence of ten years.

21
Of the
queen of
Sheba.

From the time of Moses to that of Solomon there is a chasm in the Ethiopic history. After this, however, we are furnished with some kind of regular accounts. The history commences with the queen of Sheba, who came to visit the Jewish monarch, and whom the Abyssinians suppose to have been sovereign of Ethiopia Propria; but Mr Bruce is of opinion that she was only sovereign of that territory on the eastern coast of Africa named *Saba*, which he says ought to be her title instead of *Sheba*. In favour of this opinion he likewise urges, that it was customary for the Sabeans, or inhabitants of the African district named *Saba*, to be governed by women; whereas those who inhabited the opposite side of the Arabian gulf, and who were named *Sabæan Arabs* or *Homerites*, were not only governed by kings, but would not allow their sovereigns to go abroad any where under pain of being stoned to death. The Abyssinians, as has been already hinted, claim her for their sovereign; and he informs us, that having received an account from Tamerin, an Ethiopian merchant, of the surprising wisdom and wealth of Solomon, she undertook the journey mentioned in Scripture, to ascertain the truth of the report. In this she was attended by a great many of her nobility, carrying along with her also magnificent presents for the monarch she intended to visit. According to the Abyssinian historians, she was a pagan at the time this journey was undertaken; but being struck with admiration at the sight of Solomon's grandeur, and the wisdom he displayed, she became a convert to the true religion. Another part of her history, by no means inconsistent with the character of Solomon, is, that she returned in a state of pregnancy; and within a year was delivered of a son, named *David* by Solomon; but by his mother *Menilek*, *Menelech*, or *Menelebeck*; that is, *another self*. When he grew up, he was sent to be educated at the court of his father Solomon; where having staid some time, he was accompanied home by many doctors of the law, and other Israelites of distinction, particularly Azariah the son of Zadoc the high-priest. By these the Jewish religion was established in Abyssinia, where it continued till the introduction of Christianity. The princess we speak of is named *Makeda*, *Balkis*, or *Bulkis*, by the Abyssinians. By our Saviour, and in the Ethiopic version of the Scriptures, she is styled *The Queen of the South*, and is said to have come from the uttermost parts of the earth or of the habitable world. Hence the compilers of the Universal History have inferred,

that the princess styled *The Queen of Sheba* in Scripture was really sovereign of Ethiopia. "Ethiopia (say they) is more to the south of Judæa than the territory or kingdom of Saba in Arabia Felix; consequently has a better claim than that country for the dominions of the princess whom our Saviour calls *The Queen of the South*. Ethiopia is styled *the remotest part of the habitable world* by Herodotus and Strabo; and therefore better agrees with what our Saviour has said of the queen of Sheba, that she came from 'the uttermost parts of the earth,' than Arabia. Nor can it be deemed a sufficient reply to this argument, that Arabia Felix was the uttermost part of the earth in respect to Judæa, since it was bounded by the Red Sea: for that not only Egypt, but even Ethiopia, regions beyond that sea, were known to, and had a communication with, the Jews, both before and in our Saviour's time, is indisputably clear. Lastly, from what has been suggested, it appears no improbable conjecture, that Judaism was not only known, at least in a part of Ethiopia, but nearly related to the established religion there, at the beginning of the apostolic age, if not much earlier. After all, these two opinions, so contrary in appearance, may be made consistent without great difficulty; since it is agreed, that Arabia and Ethiopia have anciently borne the same name, been included during certain intervals in one empire, and governed by one prince. Part of the Arabs and Ethiopians had the same origin, and very considerable numbers of the Abaseni transported themselves from Arabia Felix into Ethiopia; a circumstance which sufficiently proves the intercourse that formerly subsisted between the Cushites or Ethiopians of Asia and Africa."

The Abyssinian historians farther inform us, that the young prince Menilek was anointed and crowned king in the temple of Jerusalem, before he returned to his own country; that Azarias was constituted high-priest; that he brought with him an Hebrew transcript of the law; and though this book is now lost, having been burnt along with the church at Axum, the office is still continued in the line of Azarias, whose successors are styled *Nebrits*, *high-priests*, or *keepers of the church*, in that city; both church and state being modelled exactly after that of Jerusalem. Makeda continued to enjoy the sovereignty for 40 years; and the last act of her reign was to settle the succession to the throne. By this act the crown was declared hereditary in the family of Solomon for ever; it was also determined, that after her no woman should be intitled to wear the crown or act as sovereign of the country; but that the sovereignty should descend to the most distant heirs male, rather than to the females, however near; which two articles were to be considered as fundamental laws of the empire, not to be abolished. Lastly, that the male heirs of the royal family should always be sent prisoners to a high mountain, where they were to be confined till they should be called to the throne, or as long as they lived. This custom, according to Mr Bruce, was peculiar to Abyssinia; the neighbouring Shepherds being accustomed to have women for their sovereigns, which prevailed in the last century, and perhaps does so at present.

Makeda having established these laws in such a manner as not to be revocable, died in the year 986 B. C. The transactions of her son Menilek after his accession

²² Ethiopia. are not pointed out, farther than that he removed his capital to Tigré. His reign can by no means be accounted prosperous; since in his time the empire was invaded by Shishak or Sefac the king of Egypt, who plundered the temple of Jerusalem under Rehoboam. The like fate attended a rich temple which had been built at Saba the capital of the Ethiopian empire, and which might very probably occasion the removal of the imperial seat to Tigré, as already mentioned. It is indeed pretty plain from Scripture, that Ethiopia, or great part of it, was subject to this monarch; as the Ethiopians or Cushites mentioned in his army which invaded Judæa, are joined with the Libims or Libyans, and must therefore be accounted inhabitants of Ethiopia Proper. This is indeed no small confirmation of the opinion of Sir Isaac Newton, who agrees with Josephus in supposing Shishak to have been the celebrated Sefostris of profane historians. Thus far we are certain, that in the passage of Scripture just now alluded to, the sacred historian indirectly ascribes the sovereignty of Ethiopia to Shishak; and we do not find it any where hinted that another Egyptian monarch was possessed of this sovereignty. Herodotus also plainly tells us, that Sefostris was master of Ethiopia, and that no other Egyptian but himself ever possessed that empire.

²³ Revolu- During the reign of Shishak we know no particulars concerning the Ethiopians; but after his death, tions after the time of Sir Isaac Newton is of opinion that they defended Shishak. Egypt against the Libyans, who had taken an opportunity of invading the country during the civil war which took place on the death of that great conqueror. In about ten years afterwards, however, according to the same author, they became aggressors; drowned the successor of Shishak in the Nile, and seized on the whole kingdom; at which time Libya fell also into their hands. In the time of Afa king of Judah, we find the combined host of the Ethiopians and Libims or Libyans making an attack on the territories of that prince, to the number of more than a million. This may be reckoned a considerable confirmation of the piece of history just mentioned; as it is not easy to conceive how the two should combine in such a manner, unless Zerah was master of both. The total overthrow which the allied army received from Afa, gave the inhabitants of Lower Egypt an opportunity of revolting; who being sustained by an army of 20,000 auxiliaries from Phœnicia and Palestine, obliged Memnon, supposed to be the same with Amenophis, to retire to Memphis. Soon after this he was forced to leave Egypt altogether, and to retire into Ethiopia; but in about 13 years he returned with his son Ramesses at the head of a powerful army, and obliged the Canaanitish forces to retire out of the Lower Egypt; a transaction denominated by the Egyptian writers the *second expulsion of the Shepherds*.

²⁴ Defeat of Zerah by Afa king of Judah. Sir Isaac Newton is of opinion, that the Egyptian princes Menes, Memnon, and Amenophis, were the same person; and that by him Memphis was either originally built or first fortified, in order to prevent the Egyptians from entering Ethiopia. He is also supposed to have been the son of Zerah, and to have died in a very advanced age about 90 years after the decease of Solomon. Thus, according to Sir Isaac Newton's chronology, the most remarkable transac-

²⁵ Of Menes and his successors. tions of antiquity will be brought lower by ages than by the usually received computations. According to this, the Argonautic expedition happened in the time of Amenophis; though some Greek writers inform us, that the same prince assisted Priam king of Troy with a body of forces. He was succeeded by Ramesses, already mentioned, who built the northern portico of the temple of Vulcan at Memphis. The next was Moeris; who adorned Memphis, and made it the capital of his empire, about two generations after the Trojan war. Cheops, Caphrenus, and Mycerinus, succeeded in order to Moeris; the last being succeeded by his sister Nitocris. In the reign of Asychis her successor, both Ethiopia and Assyria revolted from Egypt; which, being now divided into several small kingdoms, was quickly subdued by Sabacon or So, the emperor of Ethiopia. This monarch, soon after his accession to the throne of Egypt, allied himself with Hoshea king of Israel; by which means the latter was induced to revolt from the Assyrians; and in consequence of this, an end was put to the kingdom of Israel by Shalmaneser king of Assyria, in the 24th year of the era of Nabonassar, and 720th before the commencement of the Christian era. According to Herodotus, this monarch voluntarily resigned the crown of Egypt after he had enjoyed it 50 years; but Africanus relates, that after a reign of eight years, he died in Egypt, in the ninth year of Hezekiah king of Judah. His successor

²⁶ Sennacherib defeated by Sethon. Sethon, supposed to be the Sevechus of Manetho, advanced to Pelusium with a powerful army against Sennacherib king of Assyria; when the bowstrings of the Assyrians were gnawed in pieces by a great number of rats or mice, and thus they were easily defeated with great slaughter by the Egyptians. Hence Herodotus informs us, that the statue of Sethon which he saw in Egypt had a mouse in its hand. Sir Isaac Newton, however, explains the whole in an allegorical manner. As the mouse among the Egyptians was a symbol of destruction, he conjectures, that the Assyrians were on this occasion overthrown with great slaughter; and that Sethon, in conjunction with Terhakah, either king of the Arabian Cushites, or a relation of Sethon and his viceroy in Ethiopia Proper, surprised and defeated Sennacherib betwixt Libnah and Pelusium, making as great slaughter among his troops as if their shieldstraps and bowstrings had been destroyed by mice.

²⁷ Ethiopia subdued by Esarhaddon. In the 78th year of the era of Nabonassar, the empire of Ethiopia was subdued by Esarhaddon king of Assyria; who held it three years, committing enormous cruelties both in that country and in Egypt. After his death the Ethiopians shook off the yoke, and maintained their independency till the time of Cyrus the Great the first king of Persia; who, according to the Greek historian Xenophon, seems to have also been sovereign of Ethiopia. After his death they revolted, and his son Cambyfes unsuccessfully attempted to reduce them. Herodotus informs us, that before he undertook this expedition, he sent some of the Ichthyophagi ambassadors to the king of the Macrobi or long-lived Ethiopians, under pretence of soliciting his friendship, but in reality to observe the strength of the country. Of this the Ethiopian prince was aware, and told the ambassadors that he knew their design, reproached Cambyfes with his injustice and ambition, and gave them his bow; telling them at the same time, that the Persians

²⁸ Unsuccessful expedition of Cambyfes against his country.

Ethiopia. Persians might think of invading Ethiopia when they could easily bend it; and in the mean time, that their master ought to thank the gods who had never inspired the Ethiopians with a desire of extending their territories by conquest. Cambyfes had sent by the ambassadors a rich purple robe, gold bracelets, a box of precious ointment, a vessel full of palm wine, and other things, which he imagined would be acceptable to the Ethiopian monarch. But all these, excepting the wine, were despised. This, he owned, was superior to any liquor produced in Ethiopia; and he did not scruple to intimate, that the Persians, short-lived as they were, owed most of their days to the use of this excellent liquor. Being informed by the ambassadors, that a considerable part of the food made use of by the Persians was bread, he said that it was no wonder to find people who lived on *dung* unable to attain the longevity of the Macrobian Ethiopians. In short, the whole of his answer was so contemptuous and disgusting, that Cambyfes was filled with the greatest indignation; in consequence of which, he instantly began his march without taking time to make the necessary preparations, or even to procure provisions of any kind for his army. Thus a famine ensued among them; which at last became so grievous, that the soldiers were obliged to eat one another: and Cambyfes himself, finding his life in great danger, was obliged to give orders for marching back again; which was not accomplished without the loss of a great number of men. Another army which he sent on an expedition against Ammonia, in order to destroy the celebrated oracle of Jupiter Ammon, perished entirely in the deserts, being overwhelmed with the vast clouds of sand frequently raised there by the wind.

29
Ethiopia at
this time a
powerful
empire.

30
Ethiopia
supposed by
Sir Isaac
Newton to
have been
conquered
by Camby-
fes.

31
Ethiopians
employed
by Xerxes.

At this time, it is doubtful whether Cambyfes would have accomplished his purpose even if he had found it practicable to march into the heart of Ethiopia. This empire had but a short time before received a very considerable accession of strength by the desertion of 240,000 Egyptians who had been posted by Psammenitus in different places on the frontiers. These not having been relieved for three years, had gone over at once to the emperor of Ethiopia, who placed them in a country disaffected to him; ordering them to expel the inhabitants, and take possession of their lands. Notwithstanding this, however, Sir Isaac Newton hints, that Cambyfes conquered Ethiopia about the 223d or 224th year of the era of Nabonassar; but his opinion in this respect does not appear to be well founded. We are told indeed, that the Persian monarch, notwithstanding the misfortunes he met with in the expedition above mentioned, did really make himself master of some of the Ethiopic provinces which bordered on Egypt; and that these, together with the Troglodytes, sent him an annual present of two chænixes of unrefined gold, 200 bundles of ebony, five Ethiopian boys, and 20 elephants teeth of the largest size: but it appears improbable to the last degree, that even though Cambyfes had employed the whole of his reign in the attempt, he could have conquered the vast regions of Ethiopia Proper, Sennaar, and Abassia, which were all included in the Ethiopia of the ancients.

When Xerxes invaded Greece, we find his army, according to Herodotus, was partly composed of Ethiopians, of whom Herodotus mentions two distinct races

of people. One of these inhabited the Asiatic coast, and differed from the Indians only in their hair and language. Their arms were the same with those of India; they wore helmets made of the skins of horses, the ears and manes of which served them for tufts and plumes of feathers; their shields being made of the skins of cranes. The hair of the Asiatic Ethiopians was long, but that of the western tribes was frizzled. The latter were also differently armed, having darts lighted at one end and covered with leather. We are not informed particularly from what nations these troops were brought, nor whether they were natural subjects of the king of Persia or only auxiliaries: of consequence we can conclude nothing certain concerning the dominion of the Persian monarchs at this time over Ethiopia, farther than that they might possess some of the provinces next to Egypt; while the main body of the empire being in a state of independence, and unconnected with other parts of the world, is not taken notice of by the historians of those times.

Though Alexander the Great had a desire to know the sources of the Nile, he did not suffer himself to be diverted by this curiosity from pursuing his grand expedition into Persia. Ptolemy Euergetes, however, appears to have carried this curiosity to such an extremity as to invade Ethiopia for no other purpose. It is surprising that the particulars of this expedition are not recorded by any historian, as it appears by an inscription that he penetrated to the farthest parts of the empire, and conquered the most powerful nations in it. Of this we have the following account, which is looked upon by the best historians to be authentic. It was copied on the spot (being the western entrance to Adule, one of the cities of Ethiopia) by Cosmas Egyptianus, or, as some call him, Cosmas Indicopleustes, in the time of the emperor Justin I. by order of Elestbaan king of the Axumites, and of which the following account is given by the person who copied it. "Here (says he), facing the road to Axuma, stood a chair of white marble, consisting of a square base, a small thin column at each angle of this base, with a larger wreathed one in the middle, a seat or throne upon these, a back and two sides. Behind this chair there was a large stone three cubits high, which had sustained considerable injury from time. This stone and chair contained an inscription to the following purpose: 'Ptolemy Euergetes penetrated to the farthest parts of Ethiopia. He subdued Gaza, Agame, Signe, Ava, Tiamo or Tziamo, Gambela, Zingabene, Angabe, Tiama, Athagaos, Calaa, Semene, Lafine, Zaa, Gabala, Atalino, Bega, the Tangaitæ, Anine, Metine, Sesea, Raufo, Solate, the territory of Raufo, and several other kingdoms. Among the nations he reduced, were some inhabiting mountains always covered with a deep snow; and others seated upon ridges of hills, from whence issued boiling steams and craggy precipices, which therefore seemed inaccessible. Having finally, after all these conquests, assembled his whole army at Adule, he sacrificed to Mars, Neptune, and Jupiter; for his great success, he dedicated this chair or throne to Mars.'

From the time of this conqueror to that of the emperor Augustus, we meet with nothing of any consequence relating to Ethiopia Proper. The Roman forces having about this time been drawn out of Egypt

33
Conquest
of Ethio-
pia by the
Romans.

^{Ethiopia.} Egypt in order to invade Arabia, Candace queen of Ethiopia, or perhaps rather of the island or peninsula of Meroe, took the opportunity of their absence to make an irruption, with a numerous army, into the province of Thebais. As there was at that time no force to oppose her, she met for some time with great success; but hearing at last that Petronius, governor of Egypt, was in full march to attack her, she retired into her own dominions. Petronius pursued her as far as Pselcha, where with 10,000 men he gained an easy victory over 30,000 undisciplined Ethiopian savages, armed only with poles, hatchets, and other clumsy or insignificant weapons of a similar nature. This victory was soon followed by the reduction of several fortresses; however, as the Roman soldiers were excessively incommoded by the heat of the climate, Petronius, notwithstanding his success, was obliged at last to retire. Soon after, Candace sent ambassadors to Augustus himself with such magnificent presents, that the emperor is said to have been thereby induced to grant her a peace on her own terms. From this time the Romans accounted themselves masters of Ethiopia: Augustus was complimented on the great glory he had acquired; and that he had, by reducing a country till that time unknown even to the Romans, finished the conquest of Africa. No material alteration, however, took place in the affairs of Meroe in consequence of this conquest, whether real or pretended. Pliny informs us that it had been governed by queens, who bore the title of Candace, for several generations before that time; and so it continued to be afterwards, as we learn from Scripture, where we are informed that, in the reign of Tiberius, the sovereign of Ethiopia was still named Candace. Some indeed are of opinion that the Candace mentioned in the Acts of the Apostles was the same with her who had been conquered by Augustus; but this seems by no means probable, as the interval of time is by far too long to be allowed for the reign of a single princess.

From an anecdote of the debauched emperor Helio-gabalus, who was accustomed to confine his favourites, by way of diversion, with old Ethiopian women, we may learn that some intercourse took place between the two empires, and probably that the Ethiopians owned some kind of subjection to the Romans. The Blemmyes, a gang of monstrous banditti, who inhabited the frontiers of Thebais, were vanquished by the emperor Probus: but, towards the close of the third century, we find them again become so powerful, that in conjunction with another nation called *Nobata*, who inhabited the banks of the Nile near the Upper Egypt, they committed such depredations in the Roman territories, that Dioclesian was obliged to assign lands to the latter, and to pay both of them a considerable sum annually, to desist from their former practices. These expedients did not answer the purpose; the savages continued their depredations till the time of the emperor Justinian, who treated them with more severity, and obliged them to remain at peace. We are told by Procopius, that before the time of Dioclesian, the Roman territories extended so far into Ethiopia, that their boundaries were not 23 days journey from the capital, so that probably the whole empire had been in a state of dependence on them.

From the time of this emperor to that of their con-

version to Christianity, we find nothing remarkable in the history of the Ethiopians. Three hundred and twenty-seven years are counted from the time of our Saviour to that of Abreha and Atzbeha, or from Abra and Asba, who enjoyed the kingdom when the gospel was preached in Ethiopia by Frumentius. This man was a kinsman and companion of a philosopher named Meropius, a native of Tyre; who having travelled all over India, died on an island of the Red Sea. After his death Frumentius, with another named Aedius, who had also been his companion, were brought before the king of Ethiopia, to whom that island was subject. He took them into his service; making the one his treasurer and the other his butler. On the death of this prince, the queen conceived such a favour for them, that she refused to allow them to depart out of the kingdom; but committed the management of her affairs entirely to Frumentius, who made use of his influence to diffuse the Christian religion throughout the country, and at last was appointed bishop of Axuma. It is said, however, that the court and principal people, if not the nation in general, relapsed into idolatry, which continued to prevail till the year 521, when they were again converted by their king Adad, or Aidog.

The two princes Abra and Asba, who reigned jointly in Ethiopia in the time of Frumentius, lived in such harmony together, that their friendship became almost proverbial. After being converted to Christianity, they adhered strictly to the orthodox doctrine, refusing to admit an Arian bishop into their country. In the time of the emperor Constantius, however, this heresy was introduced, and greatly favoured by that monarch; and an attempt was made to depose Frumentius on account of his refusal to embrace it.

The reign of these princes is remarkable for an expedition into Arabia Felix, called by the Mohammedan writers the war of the elephant, and which was undertaken on the following occasion: The temple of Mecca, situated nearly in the middle of the Arabian peninsula, had been held in the greatest veneration for near 1400 years; probably from the notion entertained by the people in the neighbourhood, that Adam pitched his tent on that spot. Here also was a black stone supposed to possess extraordinary sanctity, as being that on which Jacob laid his head when he had the vision of angels. The most probable account of the real origin of this temple, according to Mr Bruce, is, that it was built by Sesostris, and that he himself was worshipped there under the name of Osiris.

On account of the veneration in which this tower and idol were held by the Arabians, Mr Bruce supposes that the thought was first suggested of making it the emporium of the trade between India and Africa; but Abra, in order to divert it into another channel, built a very large temple near the Indian ocean in the country of the Homerites; and, to encourage the resort of people to this new temple, he bestowed upon it all the privileges of the former which stood in the city of Mecca. The tribe of Arabians named *Koreish*, in whose country Mecca stood, being exceedingly alarmed at the thoughts of having their temple deserted, entered the new one in the night, burned all that could be consumed, and besmeared the remains with human excrements. Abra, provoked at this sacrilege,

^{Ethiopia.}

³⁵ Ethiopians converted to Christianity by Frumentius.

³⁶ The two kings refuse to admit Arianism.

³⁷ Account of the war of the elephant.

³⁴ Account of the Blemmyes.

³⁸ ^{Ethiopia.} Miraculous destruction of the Ethiopian army. ³⁹ First appearance of the small-pox.

crilege, assembled a considerable army, with which he invested Mecca, himself appearing on a white elephant, from whence the war took its name already mentioned. The termination of the war, according to the Arabian historians, was miraculous. A vast number of birds named *Ababil* came from the sea, having faces like lions; each carrying in its claws a small stone about the size of a pea, which they let fall upon the Ethiopian army in such numbers, that every one of them was destroyed. At this time it is said that the small-pox first made its appearance; and the more probable account of the destruction of the Ethiopian army is, that they perished by this distemper.

⁴⁰ Reconversion to Christianity under Elefbaan. ⁴¹ Christians persecuted in Arabia. ⁴² Cruelty of Phineas a Jewish prince.

The war of the elephant is supposed to have terminated in the manner above-mentioned about the year 360; from which time to that of Elefbaan, named also *Caleb*, and probably the same with the Adad or Adag already mentioned, we meet with nothing remarkable in the Ethiopic history. He engaged in a war with the Homerites or Sabæans in Arabia Felix; whom he overthrew in battle, and put an end to their kingdom; after which he embraced the Christian religion in token of gratitude for the success he had met with. In the time of this prince a violent persecution of the Christians took place in Arabia. The Jewish religion had now spread itself far, into that peninsula; and in many places the professors of it were become absolute masters of the country, insomuch that several Jewish principalities had been erected, the sovereigns of which commenced a severe persecution against the Christians. Among the rest, one Phineas distinguished himself by his cruelty, having prepared a great number of furnaces or pits filled with fire, into which he threw those who refused to renounce Christianity. The Christians applied for relief to the emperor Justin; but he being at that time engaged in a war with the Persians, could not interfere: however, in the year 522, he sent an embassy to Elefbaan, who was now also a member of the Greek church, intreating him to exert himself for the relief of the Christians of Arabia. On this the emperor commanded his general Abreha, governor of the Arabian province Yemen, to march to the assistance of Aretas, son to a prince of the same name whom Phineas had burnt; while he himself prepared to follow with a more considerable force. But before the arrival of the Ethiopian monarch, young Aretas had marched against Phineas, and entirely defeated him. In a short time afterwards the emperor himself arrived, and gave Phineas a second defeat: but notwithstanding these misfortunes, it does not appear that either the principality of Phineas or any of the other Jewish ones, was at this time overturned; though it seems to be certain, that at the time we speak of, the Ethiopians possessed part of the Arabian peninsula. According to the Arabian historians, the war of the elephant, with the miraculous destruction of the Ethiopian army already mentioned, took place in the reign of Elefbaan.

⁴³ He is defeated.

Some historians mention, that the Ethiopian monarchs embraced the doctrines of Mahomet soon after the impostor made his appearance; but this seems not to be well founded: though it is certain that the *Najashi* or Ethiopian governor of Yemen embraced Mahomedanism, and that he was related to the royal family. On this occasion, however, the Ethiopians

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lost all the footing they once had in Arabia; the governors being expelled by Mohammed and his successors. They fled to the African side of the Red Sea with numbers of their subjects, where they erected several small kingdoms, as Adel, Wypo, Hadea, Mara, of Arabia, and others which still continue.

⁴⁴ Ethiopians driven out of Arabia. ⁴⁵ Number of Jews in Ethiopia increased. ⁴⁶ Royal family of Ethiopia massacred by Judith. ⁴⁷ The king escapes.

During the conquests of the caliphs, the Jews were for some time every where driven out of their dominions, or oppressed to such a degree that they voluntarily left them. Ethiopia offered them an asylum; and in this country they became so powerful, that a revolution in favour of Judaism seemed ready to take place. One family had always preserved an independent sovereignty on a mountain called Samen, the royal residence being on the top of an high rock; and several other high and rugged mountains were used by that people as natural fortresses. Becoming by degrees more and more powerful, Judith the daughter of one of their kings formed a design of overturning the Ethiopian government, and setting aside the family of Solomon, who had hitherto continued to enjoy the sovereignty. This design was facilitated by several circumstances. The empire had been weakened by an unsuccessful war, famine, and plague; the throne was possessed by an infant; and the absurd custom of confining the whole royal family on a rock named *Damo*, gave her an opportunity of cutting them all off at once by surprising that place. Fortunately, however, the king himself escaped the general catastrophe, and was conveyed by some of the nobility of Amhara to the province of Xoa or Shoa; by which means the line of Solomon was preserved, and afterwards restored, though not till after a very considerable interval.

⁴⁸ Judith usurps the throne. ⁴⁹ A new revolution takes place. ⁵⁰ Christians persecuted in Egypt fly to Ethiopia.

Judith having by this massacre established her own power, assumed the imperial dignity, though in direct opposition to an established and fundamental law of the empire already mentioned, that no woman should enjoy the sovereign power. The people, however, seemed to have submitted quietly to her government, as she sat on the throne for 40 years, and afterwards transmitted the sovereignty to her posterity; five of whom reigned successively in this country. We are not furnished with any particulars concerning their reigns; farther than that, during them, the people were greatly oppressed. By some means, of which historians have not given any account, another revolution took place, and a new set of usurpers, related to the family of Judith, but not their direct lineal descendants, succeeded to the throne. These were Christians, and governed with much greater lenity than the Jewish sovereigns had done; but still, being usurpers, none of their transactions are recorded in the Abyssinian annals, excepting those of Lalibala, who was accounted a saint. He lived in the end of the 12th or beginning of the 13th century, and proved a great prince. At that time the Christians in Egypt were grievously persecuted by the Saracens, who had a particular abhorrence at magicians, builders, and stone-cutters; looking upon them as the chief promoters of idolatry by the ornaments they put upon their works. These were joyfully received by Lalibala; who, by affording them an asylum in his dominions, soon collected a great number. They were employed by him in hewing churches out of the solid rock, after the example of the ancient Troglodytic habitations; and many works of this kind

⁵¹ **Ethiopia.** kind remain in the country to this day. He undertook, however, a still more difficult and arduous task; no less than that of lessening the stream of the Nile, and thus starving the whole kingdom of Egypt now in the hands of his enemies, and who persecuted those of his religion. From the account given by Mr Bruce of this project, it appears that there really is a possibility in nature of accomplishing it; not indeed by turning the course of the Nile itself, but by diverting that of many of its branches, which are the means of conveying into it the water supplied by the tropical rains, and by which it overflows its bank annually. We are likewise assured by the same author, that Lalibala succeeded in his enterprize so far as to divert the course of two large rivers from the Nile, and that they have ever since flowed into the Indian-ocean. He next proceeded to carry a level towards a lake named *Zacvia*, into which many rivers, whose streams contribute to increase that of the Nile, empty themselves; and had this been accomplished, there is no doubt that the loss of so much water would have been very sensibly felt by the Egyptians. According to most historians, this enterprising monarch was prevented by death from putting his design in execution; though Mr Bruce informs us of a written account at Shoa, in which it was asserted, that he was dissuaded from it by certain monks, who told him, that by sending down such a quantity of water to the eastern and dry parts of Africa, these countries would soon become so fertile and populous that they would rival the empire of Ethiopia, or at least withdraw their allegiance from it entirely. The remains of these works were seen by the Portuguese ambassador in 1522.

⁵² **Restoration of the line of Solomon.** All this time the princes of the line of Solomon had been obliged to content themselves with the sovereignty of the province of Xoa or Shoa, without making any attempt to regain their former dignity; but they were unexpectedly restored without bloodshed or disturbance by Naacueto Laeb the grandson of Lalibala above mentioned. This prince, being of a gentle and pacific disposition, was persuaded by a monk named *Tecla Haimanout*, greatly celebrated for his sanctity, to resign the crown, to which, though he received it from his father, he could not pretend any absolute right. In consequence of the mediation of this monk, therefore, it was agreed that Naacueto should give up the empire to Icon Amlac the lineal descendant of Solomon, who then possessed the sovereignty of Shoa. In consequence of this a portion of lands should be irrevocably and irredeemably assigned to him and his heirs; and he should likewise be allowed some marks of sovereignty as a testimony of his former grandeur. In this treaty, however, the good monk did not forget his own interest. He had founded a famous monastery in Shoa, and was primate of the whole empire under the title of *Abuna*. He now insisted that one third of the kingdom of Ethiopia should be absolutely ceded to himself for the maintenance of his own dignity, and the support of the clergy.

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Ethiopia. gy, convents, &c. throughout the country; he also insisted that no native Abyssinian should ever enjoy the same dignity with himself, even though he should have been chosen and ordained at Cairo, as was the custom with the Abyssinian prelates.

⁵³ These extraordinary terms were complied with, and Icon Amlac raised to the throne of Ethiopia. He did not, however, remove the seat of government from the province of Shoa; but continued at Tegulat the capital of that province during the whole of his life-time, which continued 15 years after his accession to the throne of Ethiopia. We are ignorant of the transactions of his reign, as well as that of several of his successors; five of whom ascended the throne in as many years. From this quick succession Mr Bruce is of opinion, that a civil war had taken place among the candidates for the throne: but the Abyssinian annals make no mention of this; neither have we any particular account of the transactions of the empire till the time of Amda Sion, who began to reign in 1312. He was the son of Wedem Araad, the youngest brother of Icon Amlac, and succeeded to the throne on the death of his father. He professed the Christian religion; but his practice seems to have been very opposite to its precepts. He began his reign with living publicly with a concubine of his father's; and quickly after committed incest with his two sisters. On this he was first exhorted to repentance, and then excommunicated; by Honorius, a monk greatly celebrated for his sanctity, and who has since been canonized. The prince, enraged at this indignity, caused the saint to be severely whipped through every street of his capital. That night the town was by some unknown means set on fire and reduced to ashes: the clergy persuaded the people, that the blood of Honorius had turned to fire as it dropped on the ground, and thus occasioned the catastrophe; but the king suspecting that the monks themselves had been the incendiaries, banished or imprisoned them all, so that their hopes of exciting an insurrection were disappointed; and being dispersed into those provinces where the inhabitants were mostly Jews or Pagan, they were now obliged to apply to what was certainly more incumbent upon them, viz. the diffusion of the knowledge of the gospel.

⁵⁴ While the king was busied with the monks, one of the factors, who had been entrusted with some of his commercial interests, was assassinated by the Moors in the province of Ifat; on which, without making the least complaint or expostulation, he assembled his troops, and with seven horsemen (A) fell upon the nearest Mahometan settlements, massacring all he met without exception. Putting himself then at the head of his army, he proceeded in the most rapid career of desolation, laying waste the whole country with fire and sword, and carrying off an immense booty.

For some time the Moors were so surprised that they did not think of making opposition; but at last they took up arms, and attempted to surprise the Abyssinian

(A) On this Mr Bruce remarks, that "it has been imagined the number should be increased to 70; but there would be little difference in the rashness of the action." The word in the Abyssinian annals which he translates is *seven*; but if we increase the number at all, it ought more probably to be *to seven hundred* than seventy.

Ethiopia.

58
They at-
tack his
camp in the
night with-
out success.

59
They sub-
mit, but
quickly re-
volt again.

60
King of
Hadea de-
feated and
taken pri-
soner.

61
Another
rebel chief
defeated.

62
The Fala-
sha defeat-
ed.

63
The king
marches a-
gainst Adel,
Mara, &c.

Abyssinian monarch in his camp, hearing that he had sent out most of his army in detachments. With this view they approached the camp in the night-time, expecting to have found the king and his few soldiers immersed in sleep. Unexpectedly, however, he had been joined by a considerable part of his army, whom he drew up in battle array to receive his enemies. An engagement ensued, in which the king behaved with great valour; killed the Moorish general with his own hand, and gained a complete victory. He then commanded such of his soldiers as could not find houses ready built, to build huts for themselves, and a large tract of land to be plowed and sown, as if he meant to stay in the country of the enemy during the rainy season. The Mahometans now perceiving that they were in danger of being totally exterminated, willingly submitted to the terms he pleased to impose upon them; while the monarch conciliated the affections of his people by dividing among them the vast plunder he had acquired in this expedition.

The Moors no sooner found themselves freed from any apprehensions of immediate danger, than they prepared for a new revolt. The king having intelligence of their designs, secretly prepared to subdue them before they could have time to bring their matters to a sufficient bearing. The Moors, however, being better prepared than he expected, began hostilities by surprising and plundering some villages belonging to the Christians, and destroying their churches. A most formidable combination had taken place; and as the consequence of allowing the confederate rebels to join their forces might have been very dangerous, the king used his utmost endeavours to prevent it. This design was in some measure facilitated by the superstition of Amano king of Hadea, one of the principal rebels. This man, by the advice of a conjurer in whom he put great confidence, instead of marching his troops to the assistance of his allies, remained at home with them, where he was defeated and taken prisoner by a detachment of the king's army. The governor of Amhara was next dispatched against Saber-eddin the revolted governor of Fatigar, with orders to lay waste the country, and use every method to force him to a battle, if he should be disinclined to venture it himself.

These orders were punctually executed; Saber-eddin was compelled to stand an engagement, in which he was defeated; the victors plundered his house, and took his wife and children prisoners. But in the mean time intelligence was received of a new revolt among the Falasha, who had assembled a great army, and threatened to become very formidable; their chief keeping a close correspondence with Saber-eddin, as well as with the king of Adel. These, however, shared the same fate with the rest, being entirely defeated by Tzaga Christos another Abyssinian general, who soon after joined the king with his whole army. This proved fatal to the rebel cause: Saber-eddin, no longer able to support himself against the royal forces, was obliged to surrender at discretion, and all the rest were quickly reduced; so that the king was at leisure to march against the kings of Adel and Mara, who having now united their forces, resolved to give him battle. At this the Abyssinian monarch was so exasperated, that he determined to take a most ample vengeance on his enemies. In the presence of his whole army, there-

fore, and a monk of uncommon sanctity dressed in the same habit in which he usually performed divine service, the king made a long speech against the Mahometans. He recounted the many violences which they had committed; and of which the kings of Adel and Mara had been principal promoters. He enumerated many examples of murder, sacrilege, &c. of which they had been guilty; setting forth also that they had carried off great numbers of Christians into slavery, and that the view of making slaves was now a great motive with them for making war. He disclaimed every idea of commencing hostilities from any avaricious motive; as a proof of which, he denied that he would accept of any part of the plunder for his own use; concluding with a declaration, that he was now about to swear on the holy eucharist, that, "though but 20 of his army should join him, he would not turn his back upon Adel or Mara, till he had either forced them to tribute and submission, or entirely extirpated them and annihilated their religion." After this speech, he took the oath in the presence of the whole army; who not only applauded him with loud shouts, but protested that they looked upon themselves to be all bound by the oath he had taken. As he had mentioned in his speech that the plunder had been purchased by the lives of their Christian brethren, they determined to show their abhorrence at keeping any of it on these terms. Taking lighted torches in their hands, therefore, they set fire to the whole plunder that had been amassed since the beginning of the war; and having thus reduced themselves to a state of poverty, they prepared to show their Christianity by thirsting, not after the wealth, but the blood of their enemies.

Notwithstanding the enthusiasm of the whole army on this occasion, the expedition was attended with great difficulties. These arose principally from superstition; and as, on the one hand, the Abyssinians were by this principle laid under considerable disadvantages, their adversaries on the other enjoyed equal advantages from no better cause. The Abyssinians, according to Mr Bruce, are very credulous with respect to genii or spirits which go about doing mischief in the dark. Hence they are afraid of travelling, but especially of fighting, in the night-time; because they imagine that the world is then entirely given up to these beings, who are put out of humour by the motions of men, or of any other terrestrial creature. In the night-time therefore an Abyssinian dares not even throw a little water out of a basin, lest it should fall upon some spirit and provoke it to vengeance. The Moors, on the other hand, though equally fearful, secure themselves against these invisible enemies by means no less ridiculous than the fears themselves. A verse of the Koran, sewed up in leather, and worn round their neck or arm, is sufficient to defy the power of the most mischievous genii. Under such powerful protection, therefore, they laugh at the terrors of the Abyssinians, and are on all occasions ready to attack them in the night-time, and even choose that season rather than any other for coming to an engagement. Sensible of this advantage, and encouraged by the little loss which attended even a defeat in these nocturnal encounters, they determined on the present occasion to avoid any pitched battles, and to content themselves with harassing the king's army by continual skirmishes of this

Ethiopia.

64
His speech
and oath in
presence of
his army.

65
Enthusiasm
of his
troops.

66
Excessive
superstition
of both par-
ties.

67
The king's
troops har-
assed by
frequent
encounters.

Ethiopia. this kind. Thus, though the Abyssinian monarch had always the advantage, his troops soon began to complain; and, on the commencement of the rainy season, insisted on being allowed to return.—This was by no means agreeable to a prince of such a martial disposition as Amda Sion. He therefore told them, that, if they were afraid of rains, he would conduct them to a country where there were none; meaning Adel, which, though likewise within the limits of the tropical rains, has them at another season than that in which they fall in Abyssinia. Thus he persuaded his army again to set forward: but was so grievously harassed by the nocturnal attacks of the Moors, that he was once more in danger of being deserted; and when by his eloquence he had found means to dissipate the apprehensions of the soldiers, he was seized with such a

68
He is seized
with a dan-
gerous fe-
ver.

violent fever as threatened his life. The soldiers now expected that they were soon to return; but while they indulged themselves in the carelessness which usually attends an expectation of this kind, they accidentally received intelligence that the Moors, having assembled an army of 40,000 men, were in full march to attack them, and at a very small distance. The king was now free from fever, but so weak that he fainted on attempting to put himself in readiness for going out to battle. Still, however, his resolution continued firm and unalterable; having recovered from his faint, washed and refreshed himself, he made a speech to his soldiers, filled with the most enthusiastic expressions of confidence in the justice and goodness of the cause in which he was engaged, and in the continuance of the divine favour and protection. "As it never was my opinion (said he), that it was my own strength and valour, or their want of it, which has so often been the cause of preserving me from their hands; so I do not fear at present that my accidental weakness will give them any advantage over me, as long as I trust in God's power as much as I have ever done." By this speech the drooping spirits of the Abyssinians were revived; and they only begged that their monarch would now trust to the valour of his troops, and not expose his person to such danger as he had usually done. He promised to comply with their request; but matters were soon thrown into confusion by a report that the Moors had poisoned the wells and enchanted all the running water in the front of the army. The poisoned wells, however, were easily avoided; and a priest of vast sanctity was dispatched a day's journey before the army to disenchant the waters by his blessings; which, having the advantage of the good qualities of the element itself on their side, were doubtless more powerful than the spells of the infidels. Not content with this, the king caused a river to be consecrated by the name of *Jordan*; but while his men were employed in bathing themselves in this holy water, the *Fits-Auraris*, an officer who had been dispatched with a party of men who always go before the Abyssinian armies, was attacked and driven back on the main body by a detachment of the enemy, who had along with them a number of women provided with drugs to poison and spells to enchant the waters. On this a dreadful panic seized the whole army; who, unmindful of the promises made to their king, not only refused to advance, but for the most part came to the resolution of leaving their camp, and returning homewards without

69
His troops
dishearten-
ed.

70
They are
seized with
a panic, and
refuse to
engage.

delay. The king, sensible that all was lost if this pernicious scheme should be adopted, did his utmost to encourage and persuade them to return to their duty; but perceiving that nothing was to be gained by reasoning with men so much terrified, he only requested that such as could not be induced to fight, would not leave their places, but stand quiet spectators of the battle. Even this had very little effect: so that, finding the enemy now ready to make an attack, he ordered his master of the horse, with only five others, to attack the left wing of the enemy; while he, with a small party of his servants, made an attack on the right. This desperate action was attended with success. The king, notwithstanding the weakness he yet laboured under, killed with his own hand two of the commanding officers of the enemy's right wing; while his son dispatched another of considerable rank belonging to the left. This had such an effect upon the whole Moorish army, that they began evidently to lose courage; while the Abyssinians, ashamed of their conduct, now rushed furiously on to rescue their prince from danger. The battle continued for some time with great obstinacy; but at last the centre and left wing of the Moors were entirely defeated. The right wing, composed principally of Arabians, retired in a body; but, not knowing the country, they entered a deep valley surrounded by perpendicular rocks entirely covered with wood. The Abyssinians, imagining they had nothing more to do, began to strip and mangle the bodies of the killed and wounded; but the king, perceiving that the Arabians had brought themselves into a situation from whence they never could be extricated, obliged his soldiers to desist from this barbarous employment, and even killed two of them who disobeyed his orders. The army was then divided into two parts, one of which surrounded the devoted Arabians, while the other was sent a day's journey after the remainder of the Moors. Both parties proved equally successful. The king with part of his division attacked the Arabians in front, while the rest rolled great stones down from the tops of the rocks upon them. By this they were thrown into such confusion, that being neither able to fly nor resist, they were all killed to a man. The fate of the Moors was little better. The other division of the Abyssinian army found them lying round a large pool of water which they lapped like as many dogs. In this helpless situation there was nothing requisite but to order them to be slaughtered; and this cruel order was executed with the utmost precision. The soldiers, imagining they should now discharge their vow to heaven, wearied themselves with slaughter; till at last, being almost satiated with blood, they made a few prisoners, among whom was Saleh king of Mara with his queen; the former of whom was hanged by order of Amda Sion, and the latter cut in pieces and her body given to the dogs by the soldiers.

Ethiopia.

71
He begins
the fight
with a very
few attend-
ants.

72
The Moors
defeated.

73
And almost
entirely cut
off.

This signal victory was gained in the end of July 1316; but as the rains at that season set in with violence, most of the army now again insisted on their returning home without delay. The king and principal officers, however, were of opinion, that the advantages so dearly purchased ought by all means to be pursued till they had either reduced the Mahometans to subjection, or at least deprived them of all power to make attacks on the empire with any prospect of success. This

74
Amda Sion
pursues his
advantage.

Ethiopia. opinion being adopted, the king sent back the baggage, women, and others who could be of no use to the army; retaining only the veteran soldiers, who were able to encounter more than six times the number of such

75
His further conquests.

76
Adel invaded.

77
The king of Adel defeated and killed.

78
The princes of Adel submitted.

79
Are unfavourably received.

farther into the Mahometan territories, he took up his residence in a large town called *Zeyla*; from whence he, that very night, sent out a detachment to surprise a large village in the neighbourhood named *Taraca*. This was executed with success; the men were massacred, and the women kept to supply the places of those who had been sent away. Continuing still to advance, he detached parties to lay waste the countries all round; and in this expedition he had the good fortune to cut off two of the principal authors of the conspiracy against him. He then proceeded to invade *Talab* and *Abalge* in the territories of the king of *Adel*. That monarch, now rendered desperate by the view of approaching ruin, had assembled all the troops he could raise, in order to make one last effort against the enemy; but conducted himself with much less prudence than he ought to have done when contending with such an experienced and vigilant adversary. *Amda Sion*, confident of success, took no less care how to prevent the enemy from escaping than how to gain the victory. For this purpose he dispatched parties of horse to lie in wait in all those avenues by which he supposed that the Moors might attempt to make their escape; after which, falling furiously on the *Adelians* himself, and being well supported by his troops, he gained a complete victory; the king of *Adel*, with great numbers of his men, being killed on the spot, and almost all the rest by the parties of horse whom the *Abyssinian* monarch had posted in ambush to intercept them.

As the loss of this battle rendered the affairs of the *Adelians* quite desperate, the three young princes, sons to the late king, with their uncle, waited upon *Amda Sion* with rich presents, which they laid at his feet in the most humble manner, putting their foreheads in the dust, and intreating his pardon; professing their subjection and readiness to obey his commands, provided that he would spare the remainder of their country and property. To this the king made a very unfavourable reply, reproaching them with indignities done to himself; but especially with the sacrilege they had committed in burning churches and murdering priests, destroying also defenceless people in villages, merely because they imagined that he would not protect them. To punish these and other crimes, he said, he was now in the heart of their country; and he was determined never to turn his back upon *Adel* while he had ten men capable of drawing their swords; for which reason he commanded them to return and expect the approach of his army.

By this fierce speech the brother and two eldest children of the king of *Adel* were so disheartened, that they could not speak; but the youngest son made a very spirited speech, in which he attempted to soften the king by complimenting his valour, and showing that it was unworthy of his character to push the war against a people who were already conquered and defenceless. All the answer he could obtain, however, was, that unless the queen with the rest of the royal family, and the principal people of the nation, would come by to-morrow evening and surrender themselves

as the princes had done, he would lay waste the territory of *Adel*, from the place where he sat to the Indian ocean. On this the princes earnestly requested their mother to submit without reserve to the clemency of the *Abyssinian* monarch, and to wait upon him next morning; but she was prevented from this by some of the nobility who had formerly advised the war, and who justly suspected danger to themselves if they should be obliged to submit unconditionally to the conqueror. They resolved, therefore, to venture a battle once more; and the better to ensure success, they bound themselves by an oath to stand by each other to the last extremity. At the same time they dispatched messengers to the princes, requesting them to make their escape with all manner of expedition, and to head the army themselves; all of whom were determined to conquer or die as soon as the royal family should be out of the enemy's hands. By this conduct the *Abyssinian* monarch was so much irritated, that he divided his army into three parts; two of which he commanded to enter the territory of the enemy by different routes, and to exterminate both man and beast wherever they came; while he himself, with the third, took the straight road to the place where the new *Adelian* army was encamped. Here he found a number of infantry drawn up and ready to engage him; but, besides these, there was a multitude of old men, women, and even children, all armed with such weapons as they could procure. Surprised at this sight, he ordered a party of horse to disperse them; but this was found impossible; so that he was obliged to call in the detachments he had sent out, with orders to fall upon the enemy by the nearest way they could advance. The engagement was for a long time very doubtful; and in opposition to *Amda Sion* appeared the young king of *Wypo*, who every where encouraged his troops, and made the most obstinate resistance. The *Abyssinian* monarch having observed him, sheathed his sword, and arming himself with a bow, chose the broadest arrow he could find, and took so just an aim, that he shot the young prince through the side of the neck, and his head inclining to one shoulder he soon fell down dead. On this the spirit of the *Adelians* entirely forsook them, and they betook themselves to flight; but unluckily falling in with two *Abyssinian* detachments coming to the king's relief, they were so completely destroyed, that only three of them are said to have made their escape. On the side of the *Abyssinians*, however, the victory was dearly purchased; many of the principal officers being killed, and scarcely one of the cavalry escaping without a wound.

The remainder of this expedition consisted only in the destruction and burning of towns and villages, and massacres of helpless people, on pretence of retaliating the injuries committed by the Mahometans against the Christians. At last, weary of conquest and of carnage, this victorious monarch, who never suffered a defeat in any battle, returned in triumph to his capital, where he ended his days after a reign of 30 years. In his time we find that the royal family were not confined, as had been the usual practice from the time of the queen of *Sheba* to the massacre by *Judith*; for *Saifly*, *Araad*, the son and successor of *Amda Sion*, distinguished himself in one of the battles in which his father was engaged.

Though the new prince, as appears from what has been

Ethiopia.

80
The war continues.

81
An obstinate battle.

82
The Moorish army entirely cut off.

83
Dreadful devastations.

84
The royal family not confined as former.

Ethiopia
85
Reign of
Saif Araad.

been just now observed, was by no means destitute of military talents, the Abyssinian empire enjoyed a profound peace during his reign. The only remarkable transaction was the relief given by him to the Coptic patriarch, whom the sultan of Egypt had thrown into prison. At this time a great trade was carried on through the desert by caravans between Cairo and Abyssinia, as well as from Cairo and Suakem on the Red Sea; but the Ethiopic monarch having seized the merchants from Cairo, and sent parties of horse to interrupt the caravans in their passage, the sultan was soon content to release the patriarch, whom he had imprisoned only with a view to extort money.

86
Of Theodor-
us.

In the reign of Theodorus, who held the crown of Ethiopia from the year 1409 to 1412, we find an infringement made on the treaty between Icon Amlac and the Abuna Tecla-Haimanout formerly mentioned. By that treaty the Abuna was to have a full third of the whole empire for the support of his own dignity and that of the church: but Theodorus, justly considering this as an unreasonable acquisition, reduced it very considerably, though he still allowed a very ample revenue out of every province of the empire; and even this has been considered by several of his successors as far too large, and has consequently been frequently abridged by them. The annals of this prince's reign are very defective, and Mr Bruce supposes that they have been mutilated by the ecclesiastics; which, considering what we have just now related of his reducing their revenues, is by no means improbable. By his subjects he was considered as such a saint, that to this day the people believe he is to rise again and to reign a thousand years in Abyssinia; during which period war is to cease, and happiness to be universally diffused.

87
Is celebra-
ted as a
saint.

From the time of Theodorus to that of Zara Jacob, who began his reign in 1434, the Abyssinian annals furnish us with little or nothing of any consequence. The character of this prince is represented as by no means inferior to that of Theodorus, or indeed of any monarch that ever sat on the throne of Ethiopia, or any other kingdom in the world. He is in short set forth as another Solomon, and a model of what sovereigns ought to be; though, from some particulars of his reign, this character should seem to be rather exaggerated. The first

88
Zara Jacob
said to equal
Solomon.

remarkable transaction of this great monarch was his sending an embassy to the council of Florence. The ambassadors were certain priests from Jerusalem, who in that assembly adhered to the opinions of the Greek church; and the embassy itself was judged to be of such consequence as to be the subject of a picture in the Vatican. This prince obtained also a convent at Rome from the pope for the use of the Abyssinians; which is still preserved, though very seldom visited by those for whom it was designed. He seems to have been very desirous of keeping up a correspondence with the Europeans as well as the Asiatics; and in his time we first read of a dispute in Abyssinia with the *Frangi* or Franks on the subject of religion. This was carried on in presence of the king between one Abba George and a Venetian painter, Francisco de Branco Lone, in which the former confuted and even convinced his antagonist; but from this time we find a party formed for the church of Rome, and which probably took its rise from the embassy to the council of Florence.

89
Sends an
embassy to
the council
of Florence.

The prince of whom we now treat was the first who

introduced persecution on a religious account into his dominions; and for this reason most probably he is so highly commended by the ecclesiastics. The state of religion in Abyssinia was now indeed very corrupt. The Greek profession had been originally introduced from the church of Alexandria; but in the low provinces bordering on the coast of Adel, the Mahometan superstition prevailed. Many of that persuasion had also dispersed themselves through the towns and villages in the internal parts of the empire, while in not a few places the grossest idolatry still took place; such as the worship of the heavenly bodies, the wind, trees, cows, serpents, &c. All this had hitherto passed unnoticed; but in the reign of Zara Jacob, some families being accused of worshipping the cow and serpent, were brought before the king, who pronounced sentence of death upon them. Their execution was followed by a royal proclamation, that whoever did not carry on his right hand an amulet with these words upon it, "I renounce the devil for Christ our Lord," should not only forfeit his personal estate, but be liable to corporal punishment. The spirit of persecution thus begun, quickly diffused itself, and an inquisitor was appointed to search for criminals. This was one Amda Sion, the king's chief confident, who pretended to all that absurd and austere devotion common to religious hypocrites. In this he was flattered with uncommon parade and attendance, the usual rewards of people of that stamp; as he never appeared abroad but with a great number of soldiers, trumpets, drums, and other ensigns of military dignity waiting upon him. He kept also a number of spies, who brought him intelligence of those who were secretly guilty of any idolatrous or treasonable practices; after which, proceeding with his attendants to the house of the delinquent, he caused the family first supply himself and his party with refreshments, and then ordered the unhappy wretches to be all put to death in his presence. Among those who suffered in this barbarous manner were the two sons-in-law of the king himself, who had been accused by their wives, the one of adultery, and the other of incest; on which slight ground they were both put to death in their own houses in such a manner as deservedly threw an odium on the king. His conduct was afterwards so severely condemned by certain clergymen from Jerusalem, that a reformation seems to have been produced; and no mention is afterwards made of the inquisitor or persecution during this reign.

Ethiopia.
91
Religious
persecution
introduced.

92
Amda Sion
a cruel in-
quisitor.

93
Murder of
the king's
sons-in-
law.

94
Persecution
suppressed.

95
Affairs of
the king-
dom regu-
lated

96
Churches
repaired.

The attention of the king was now called off from religion to the state of his affairs in the different provinces of the kingdom. As the Moorish provinces were very rich, by reason of the extensive trade they carried on, and frequently employed their wealth in exciting rebellions, it became necessary that the sovereign himself should examine into the circumstances and dispositions of the several governors; which was likewise proper on another account, that he might assign to each the sum to be paid. On this occasion he divided the empire more distinctly, and increased the number of governments considerably; which being done, he set about repairing the churches throughout the country, which had fallen into decay, or been destroyed in the war with the Mahometans. So zealous was he in this respect, that having heard of the destruction

⁹⁷ **Ethiopia.** Destruction of the church of the Virgin in Alexandria by fire, he instantly built another in Ethiopia, to repair the loss which Christianity might have suffered.

The last public transaction of this prince's reign was the quashing of a rebellion which some of his governors had entered into; but whatever glory he might acquire from this or any other exploit, his behaviour with regard to his domestic affairs must certainly place him in a very disadvantageous light. In the decline of the king's life, the mother of the heir apparent conceived such an extreme desire to behold her son in possession of the throne, that she began to form schemes for obliging his father to take him into partnership with him in the government. These being discovered, her husband cruelly caused her to be whipped to death: and finding that his son afterwards performed certain solemnities at her grave in token of regard for her, he caused him to be loaded with irons and banished to the top of a mountain; where he would probably have been put to death, had not the monks interfered. These having invented prophecies, dreams, and revelations, that none but the young prince Bæda Mariam was to possess the throne, the old king submitted to the decrees of heaven, and relaxed in his severity.

⁹⁸ The royal family again confirmed. On the accession of the new king in 1468, the old law for imprisoning all the royal family was revived, and a mountain named *Geshen* chosen for the purpose. Having thus secured himself from any danger of a rival in case he should undertake a foreign expedition, he proclaimed a pardon to all those who had been banished during the former reign, and thus ingratiated himself with his people; after which he began to prepare for war. At this the neighbouring princes, particularly the king of Adel, being alarmed, sent ambassadors requesting the continuance of peace. The Abyssinian monarch told them, that his design was to destroy the Dobas; a race of Shepherds very wealthy, but extremely barbarous, professing the pagan religion, and greatly resembling the Gallas. The reason of his commencing hostilities against them was, that they made continual inroads into his country, and committed the greatest cruelties; on which account he determined not to make war as with a common enemy, but to exterminate and destroy them as a nuisance. The king of Adel was no sooner possessed of this piece of intelligence, than he communicated it to the Dobas; desiring them to send their women and children, with their most valuable effects, into his country, till the invasion should be over. This proposal was readily embraced; but Bæda having got notice of it, seized an avenue through which they must necessarily pass, and massacred every one of the company. After this, entering their country, he committed such devastations, that they were glad to submit, and even to renounce their religion in order to free themselves from such a dreadful enemy. The king then turned his arms against Adel, where he was attended with the usual success; a most complete victory being gained over the Moors by the Abyssinian general: but while the king himself was advancing towards that country, with a full resolution to reduce it to the most abject state of misery, he was seized with a pain in his bowels, which occasioned his death.

¹⁰¹ Death of the king.

The discovery of the kingdom of Ethiopia or Abyssinia by the Europeans took place about this time. It

has already been observed, that some intercourse by means of individuals had been carried on betwixt this country and Italy; but the knowledge conveyed to Europeans in this manner was so imperfect and obscure, that it scarce amounted to any thing. Even the situation of the country had been forgot; and though some confused notions were entertained of a distant Christian prince who was likewise a priest, Marco Paulo, the famous Venetian traveller, affirms, that he had met with him in Tartary; and it was universally agreed that his name was *Joannes Presbyter, Prete Janni, or Presbyter John*. When the Portuguese began to extend their discoveries along the coast of Africa, more certain intelligence concerning this prince was obtained. Bemoy, one of the kings of the Jafosses, a nation on the western coast of Africa, had assured the Portuguese navigators of the existence of such a prince so strongly, that the king determined to send ambassadors to him; and the discovery was of the greater consequence, that a passage to the East Indies was now attempted both by land and sea. The ambassadors were named *Peter Covillan* and *Alphonso de Paiva*. These were sent to Alexandria in Egypt, from whence they were to set out on their journey; the intent of which was, to explore the sources of the Indian trade, the principal markets for the spice, &c. but above all, to discover whether it was possible to arrive at the East Indies by sailing round the continent of Africa.

In the prosecution of this scheme our two travellers went from Alexandria to Cairo; from thence to Suez at the bottom of the Red Sea; from Suez they took their route to Aden, a wealthy and commercial city beyond the straits of Babel Mandel. Covillan now set sail for India, and De Paiva for Suakem. The latter lost his life without making any discovery; but Covillan passed over to Calicut and Goa. From thence he returned to the continent of Africa, visiting the gold mines of Sofala, and passing from thence to Aden and Cairo; at which last place he was informed of the death of his companion. In this city he was met by two Jews with letters from the king of Abyssinia. One of these Jews was sent back with letters to the Abyssinian monarch; but with the other he proceeded to the island of Ormus in the Persian gulf. Here they separated; the Jew returning home, and Covillan repassing the straits of Babel Mandel, whence he proceeded to Aden, and afterwards entered the Abyssinian dominions.

The reigning prince at this time was named *Alexander*; and when Covillan arrived, he was employed in levying contributions upon his rebellious subjects. He met with a kind reception; and was conveyed to the capital, where he was promoted to the highest posts of honour, but never allowed to return to Europe again. The intelligence, however, which he transmitted to the court of Portugal proved of much importance. He not only described all the ports of India he had seen, with the situation and wealth of Sofala, but advised the king to prosecute the discovery of the passage round Africa with the utmost diligence; affirming, that the Cape at the southern extremity of the continent was well known in India; and accompanying the whole with a chart which he had obtained from a Moor, and which showed exactly the situation of the Cape and neighbouring countries.

Covillan

¹⁰² Discovery of Ethiopia by the Europeans.
¹⁰³ Of Presbyter John.

¹⁰⁴ Ambassadors sent from the king of Portugal.

¹⁰⁵ Account of their travels.

¹⁰⁶ Important intelligence conveyed to Portugal by Covillan.

Ethiopia. Covillan arrived in Ethiopia about the year 1490;

107
Reign of
Alexander.

108
Meditates
a war a-
gainst Adel.

109
He is de-
serted by
his prime
minister
and most of
his army in
battle, but
gains a vic-
tory.

110
Alexander
murdered.

111
Reign of
Naod.

112
Maffudi
ravages the
Abyssinian
territories.

and the prince to whom he addressed himself was Alexander the son of Bæda Mariam. He seems to have been endowed with many good qualities, and no less versed in military affairs than any of his predecessors. His reign was disturbed by plots and rebellions, which at last proved fatal to him. From his early years he manifested a great desire to make war on the king of Adel, who seems to have been the natural rival of the Ethiopic princes. But the Adelian monarch, having now become sensible that he was not able to cope with such powerful adversaries, took the most effectual way of securing himself; viz. by gaining over a party at the court of Abyssinia. In this he had now succeeded so well, that when Alexander was about to invade Adel, Za Saluce the prime minister, with many of the principal nobility, were in the interest of his adversary. Not being apprized of this treachery, however, Alexander entrusted this minister with the command of a great part of his forces; and with these the latter abandoned him in the heat of an engagement. Alexander and the few troops who remained with him, however, were so far from being disheartened by this treachery, that they seemed to be inspired with fresh courage. The king having killed the standard-bearer of the enemy, and thus become master of the green ensign of Mahomet, the enemy began to give way; and on his killing the king of Adel's son, immediately after they quitted the field altogether. The victory was not by any means complete; neither was Alexander in a situation to pursue the advantage he had gained. Having therefore challenged the Moors to a second engagement, which they declined, he returned with a design to punish his perfidious minister Za Saluce, who had endeavoured to excite the governors of all the provinces to revolt as he went along. The traitor, however, had laid his plots too well; so that his sovereign was murdered in two days after his arrival in the capital. Za Saluce did not enjoy the rewards he expected from his treachery: for having attempted to excite a revolt in the province of Amhara, he was attacked by the nobility there; and his troops deserting him, he was taken prisoner without any resistance, his eyes were put out, and himself exposed on an ass, to the curses and derision of the people.

Alexander was succeeded by an infant son, who reigned only seven months; after which his younger brother Naod was chosen king by the unanimous voice of the people. He proved a wise and virtuous prince; but the late misfortunes, together with the corruption introduced at court by the Mahometans, had so unhinged the government, that it became very difficult to know how to manage matters. Judging very properly, however, that one of the most effectual methods of quieting the minds of the people would be an offer of a general pardon; he not only proclaimed this, but likewise, "That any person who should upbraid another with being a party in the misfortunes of past times, or say that he had been privy to this or that conspiracy, had received bribes from the Moors, &c. should be put to death without delay." On his entering upon government, he found it necessary to prepare against an enemy whom we have not heretofore mentioned, viz. Maffudi, prince of a district named Arar, which lay in the neighbourhood of Adel. This chief-

tain being a man of a very enterprising and martial disposition, and a most violent enthusiast in the Mahometan cause, had made a vow to spend 40 days annually in some part of the Abyssinian dominions during the time of Lent. For this purpose he kept a small body of veteran troops, with whom he fell sometimes on one part, and sometimes on another of the frontiers of Ethiopia, putting to death without mercy such as made resistance, and carrying off for slaves those who made none. For 30 years he continued this practice; beginning exactly on the first day of Lent, and proceeding gradually up the country as the term advanced. His progress was greatly facilitated by the superstition of the people themselves, who kept that fast with such rigour as almost entirely to exhaust their strength; so that Maffudi having never met with any opponent, was always sure of success, and thus came to be reckoned invincible. On the present occasion, however, he experienced a prodigious reverse of fortune. Naod having enjoined his soldiers to live in the same full and free manner during the fast as at any other time, and having set the example himself, marched out against his enemy; who being ignorant of the precaution he had taken, advanced with his usual confidence of success. The Abyssinian monarch, still pretending fear, as if on account of the weakness of his men, pitched his camp in very strong ground, but left some passages open to it, that the enemy might make an attack. This was done contrary to the advice of their leader; and the consequence was, that almost every one of them was cut off. On this the king of Adel sent ambassadors to solicit a continuance of the peace with himself; which was granted, upon condition that he restored all the slaves whom Maffudi had carried off in his last year's expedition; with which the Mahometan chief thought proper to comply rather than engage in such a dangerous war.

Naod having thus freed his country from the danger of any foreign invasion, applied himself to the cultivation of the arts of peace, and reforming the manners of his subjects, in which he spent the remainder of his days. He died in 1508, after a reign of 13 years; and was succeeded by his son David III. a child of 11 years of age. Though the affairs of the empire were at present in such a state as required a very prudent and active administration, the Empress Helena, widow of Bæda Mariam, had interest enough to get the crown settled on the infant just mentioned. This proceeded partly from her desire of engrossing all the power into her own hands, and partly from a wish to keep peace with Adel her native country. These ends could not be accomplished but by keeping a minor on the throne of Abyssinia; which was therefore her constant object as long as she lived. But though this might not have been attended with any very bad consequence had the two nations been left to decide the quarrel by themselves, the face of affairs was now quite changed by the interference of the Turks. That people having now conquered almost the whole of Arabia to the Indian ocean, being likewise on the point of reducing Egypt, and having a great advantage over their adversaries in using firearms, now projected the conquest of India also. In this indeed they were always disappointed by the su-

Ethiopia.

113
He is de-
feated.

114
David III.

115
Abyssinia
in danger
from the
Turks.

perior

Ethiopia.

116

An embassy
sent to Por-
tugal.

perior valour of the Portuguese; but as this conquest remained a favourite object with them, they did not abandon their attempts. All along the countries which they had conquered, they exacted such enormous contributions from the merchants, that vast numbers of them fled to the African side of the Red Sea, and settled on the coast of Adel. The Turks, surprised at the increase of trade in this country, which they themselves had occasioned, resolved to share in the profits. For this purpose they took possession of Zeyla, a small island in the Red Sea, directly opposite to the coast of Adel; and erected a custom-house in it, where they oppressed and ruined the trade as in other places. Thus both Adel and Abyssinia were threatened with a most formidable enemy, which it would have been utterly out of their power to have resisted, had not the desire of possessing India constantly prevented the Turks from directing their strength against these countries. Helena was sensible enough of the dangerous situation of the empire, but preferred the gratification of her ambition to the good of her country; however, that she might preserve herself from the attacks of such a formidable enemy, it was now thought proper to enter into an alliance with the Portuguese. The ambassador from Portugal Peter Covillan, was denied the liberty of returning to his own country, as has been already related; and as, for some time past, it had not been obvious how he could be of much use, he had begun to fall into oblivion. The present emergency, however, recovered his importance. The empress was sensible of the necessity she lay under of having some person who understood both the Abyssinian and Portuguese languages before she could open any correspondence with that nation, and who might likewise inform her of the names of the persons to whom her letters ought to be addressed. By him she was now instructed in every thing necessary to the success of her embassy. The message was committed to one Matthew an Armenian merchant, with whom a young Abyssinian was joined; but the latter died by the way. The letters they carried are by Mr Bruce supposed to have been partly the work of Covillan and partly of the less experienced Abyssinian confidants of the empress. They began with telling the king, that Matthew would give him information of her whole purpose, and that he might depend on the truth of what he said; but in the latter part the whole secret of the embassy was disclosed, and a force sufficient to destroy the Turkish power was expressly solicited. Among the other particulars of this embassy also it is said, that a third part of Abyssinia was offered in case her requisitions were complied with; but this, as well as the embassy itself, was always denied by David when he came of age.

117

The ambas-
sador ill
used.

Matthew, tho' raised from the rank of merchant to that of an ambassador, could not, it seems, act according to his new dignity in such a manner as to screen himself from the most mortifying and dangerous imputations. Having arrived at Dabul in the East Indies, he was seized as a spy, but relieved by Albuquerque the viceroy of Goa; and that not out of any regard to his character as ambassador, but because he himself had a design upon Abyssinia. This viceroy used his utmost endeavours to induce Matthew to deliver his commissions to him; but the ambassador constantly refused to show any letter he had, except to the king of Portugal

N^o 119.

in person, and in his own kingdom. This put him out of favour with the viceroy; while his attendants, displeased at the mean appearance of the man, insisted sometimes that he was a spy from the sultan, at others that he was a cook, an impostor, or a menial servant. Matthew, however, perceiving that he was now out of danger, maintained that his person was sacred, and insisted on being treated as the representative of a sovereign. He let the viceroy, bishop, and clergy know, that he had with him a piece of the wood of the true cross, sent as a present to the king of Portugal; and he required them, under pain of sacrilege, to pay respect to the bearer of such a precious relic, and to celebrate its arrival as a festival. This was instantly complied with, and a solemn procession instituted; but very little regard appears to have been paid to this ambassador either in his temporal or spiritual character, as he could not obtain leave to depart for Portugal till 1513, which was three years after he arrived in India. In his passage he was extremely ill-treated by the shipmasters with whom he sailed: but of this they soon had cause to repent; as on their arrival at Lisbon they were all put in irons, and would probably have died in confinement, had not Matthew made intercession for them with the king.

In the mean time, Maffudi having recovered from the defeat given him by Naod, and formed alliances with the Turks in Arabia, had renewed his depredations on the Abyssinian territories with more success than ever. Such a number of slaves had been, by his assiduity, sent to Mecca, that he was honoured with a green silk standard (an emblem of the true Mahometan faith), with a tent of black velvet embroidered with gold, and he was likewise made Sheykh of Zeyla; so that, as this island was properly the key to the Abyssinian empire, he could neither be rewarded with greater honour nor profit. This happened when David had attained the age of 16; and in consequence of such surprising success, the king of Adel, never a hearty friend to Abyssinia, determined to break the peace with that empire and make an alliance with Maffudi. Having taken this resolution, the two princes invaded Abyssinia with their joint forces, and in one year carried off 19,000 Christian slaves, so that a general terror was spread over the whole empire. David, already impatient of the injuries his people had sustained, determined to raise an army, and to head it in person as his ancestors had done, contrary to the advice of the empress, who, considering only his youth and inexperience in military affairs, wished him to have employed some of his veteran officers. A very powerful army was raised, and ample supplies of all kinds were procured. With one part of his forces the emperor took the road to Aussa the capital of Adel; sending the other under the command of an officer named *Betwudet*, to meet the Moorish army, who were then ravaging part of Abyssinia. It was natural to be imagined, that the Moors, on hearing that an army was marching to destroy the capital of their country, would abandon the thoughts of conquest or plunder to preserve it. In doing this, David knew that they had certain defiles to pass before they could reach Adel. He ordered *Betwudet* therefore to allow them to enter these defiles; and before they could get through, he himself with the main body of the army, marched to attack them

118

Maffudi re-
news his
depreda-
tions worse
than ever.

119

David
marches a-
gainst him.

¹²⁰ **Ethiopia.** them at the other end. Thus the Moors were completely hemmed in by a superior army: but besides this unfavourable situation, they were farther dispirited by Maffudi. That hero came, on the morning of the engagement, to the king of Adel, informing him that his own time was now come; that he had been certainly told by a prophet, long ago, that if this year (1516) he should fight the king of Abyssinia in person, he should lose his life. He was assured that the Abyssinian monarch was then present, having seen the scarlet tent which was used only by the sovereigns of that country; and therefore advised the king of Adel to make the best of his way over the least steep part of the mountain before the engagement began. The Adelian monarch, who had at any rate no great inclination to fight, was not inspired with courage by this speech: he therefore followed the advice given him; and, with a few of his friends, passed the mountain, leaving his troops to their fate. The Moors, in the mean time, being abandoned by one leader, and having another devoted to destruction, showed an uncommon backwardness to engage, which was taken notice of by their enemies. Maffudi, however, as soon as he supposed the king of Adel to be out of danger, sent a trumpet to the Abyssinian camp, with a challenge to any man of quality in the army to fight him; on condition that the party of the victorious champion should be accounted conquerors, and that the armies should immediately separate without further bloodshed. The challenge was instantly accepted by a monk named *Gabriel Andreas*; who, in the reign of Bæda Mariam, had been condemned to lose the tip of his tongue for speaking slightly of the king's proclamation of amnesty. ¹²¹ Maffudi showed no reluctance to present himself; but received such a stroke from his antagonist with a two-handed sword as almost cut his body in two, and he immediately fell down dead. Andreas cut off his head; and throwing it at the king's feet, cried out, "There is the Goliath of the infidels." This became the signal for a general engagement, notwithstanding the terms stipulated by Maffudi before the combat. ¹²² The Moors were quickly repulsed by the king's troops, and driven backward through the defile. At the other end they were met by the Betwudet (B), who drove them back to the king's forces; so that at last being forced to fly to the mountains, they were all slaughtered by the peasants or perished with hunger and thirst.

¹²³ The same day that this victory was gained over the Moors by David, being in the month of July 1516, the island of Zeyla in the Red Sea was taken and the town burnt by the Portuguese fleet under Lopez Suarez de Alberguiera. The Abyssinian ambassador, Matthew, in the mean time, had been received with the greatest marks of esteem in Portugal. The utmost attention was paid to his embassy; he was lodged in the most splendid manner; and his maintenance was suitable to his lodging. The king prepared an embassy on his part, and sent home Matthew on board the Indian fleet commanded by Lopez. The ambassador ordered for Abyssinia was one Edward Galvan, a man who had filled many state departments with the ut-

¹²⁴ **Ethiopia.** most applause; but who by reason of his age, being now 86, was certainly very unfit for such a distant and perilous voyage. He died accordingly on the island of Camaran in the Red Sea, where Suarez had imprudently landed, and passed the winter in the utmost distress for want of provisions of every kind. This admiral was succeeded by Lopez de Seguyera; who sailed first to the island of Goa in the East Indies, where he fitted out a strong fleet; after which he returned to the Red Sea, and landed on the island of Massuah, having along with him Matthew, about the authenticity of whose mission there had been such disputes. At his first approach the inhabitants fled; but at last he was accosted by a Christian and a Moor from the continent, who informed him that the coast opposite to Massuah was part of the kingdom of Abyssinia, and that it was governed by an officer named *Babarnagash*; that the inhabitants of the island were Christians; that the reason of their flying at the sight of the Portuguese fleet was that they took them for Turks, who frequently made descents, and ravaged the island, &c. The admiral dismissed them with presents; and soon after had a visit from the governor of Arkeeko, a town on the continent; who informed him, that about 24 miles up the country there was a monastery, seven of the members of which were now deputed to wait upon him. These instantly knew Matthew, and congratulated him in the warmest manner upon his return from such a long voyage. An interview soon took place between the *Babarnagash* himself and Lopez. The Abyssinian informed him, that the coming of the Portuguese had been long expected, in consequence of certain ancient prophecies; and that he himself and all the officers of the emperor were ready to serve him. They parted with mutual presents; and all doubt about Matthew being now removed, he prepared to set out for the emperor's court; while Roderigo de Lima was nominated ambassador in place of Galvan who died. Along with them were 15 Portuguese; all men of the most determined courage, and who would hesitate at nothing which they thought might contribute to the glory of their king, their own honour, or the advantage of their country. Their present journey indeed was much more perilous than their voyage from Portugal to Abyssinia. The emperor was at this time in the southern part of his dominions, but the Portuguese had landed on the northern part; so that they had almost the whole breadth of the empire to pass before they could meet with him. The very first journey they attempted was thro' a wood so thick that it could scarce afford a passage either to man or beast, while the interstices of the trees were so interwoven with briers and thorns of various kinds, that their passage was rendered almost impracticable. This was rendered still more terrible by the vast numbers of wild beasts they saw, and which seemed only to be prevented from devouring them by the appearance of so many men together. The rainy season was also now begun; so that they were exposed to incessant deluges of water descending from the clouds, besides frequent and violent storms of wind, thunder and lightning, &c. To add to their misfortunes, an epidemic fever broke out among them,

¹²⁵ **Ethiopia.** which

(B) This is the title of one of the officers in Abyssinia, not the proper name of a man.

Ethiopia.

126

Are very
indifferent-
ly received
by the em-
peror, and
long detain-
ed.

which carried off Matthew and one of the servants of Don Roderigo. At last, after a most tedious and toilsome journey, from the 16th of April to the 18th of October 1520, the Portuguese ambassador, with his retinue, came within sight of the Abyssinian camp at the distance of about three miles. His reception was by no means favourable; for instead of being immediately admitted to the presence of the emperor, he was waited on by one of the officers of state, styled, in token of humility, *Hadug Ras*, or *commander of asses*; who caused him pitch his tent three miles farther off from the camp: and it was not till five years afterwards that he was enabled to finish the business of his embassy, and obtained leave to depart for Portugal.

127

At last al-
lowed to de-
part with
an ambassa-
dor from
the empe-
ror.

During all this time not a single word had passed relating to the affairs of the two nations; so that it is difficult to imagine what might have been the design of the Abyssinian emperor. At last, having resolved to send an embassy to Portugal, he allowed Roderigo to depart, but detained two of his people, appointing Zaga Zaab, an Abyssinian monk, his ambassador to Portugal.

128

Bad effects
of this de-
lay.

This long intercourse betwixt two such distant nations, however, could not but greatly alarm the Mahometan powers, who were natural enemies to both. Selim the Turkish sultan, having been constantly defeated by the Portuguese in the east, and alarmed at the thoughts of having a fleet of that nation in the Red Sea, where they might greatly annoy his settlements on the coast of Arabia, determined to carry his arms to the African side; while the king of Adel, having strengthened himself by alliances with the Turkish officers in Arabia, was now become a much more formidable enemy than before. This was soon experienced in a battle with the Adeliens; in which the Abyssinian monarch was overthrown with the loss of almost all his great officers and principal nobility, besides a vast number of private men. The victory was principally owing to the assistance given by the Turks; for the army was commanded by Mahomet surnamed *Gagné*, i. e. *left-handed*, governor of Zeyla which had now received a Turkish garrison. This man, having the conquest of Abyssinia greatly at heart, resolved, as soon as possible, to effect something decisive; and therefore having sent to Mecca all the prisoners taken in his late expedition, he obtained in return a considerable number of janizaries, with a train of portable artillery. Thus the fortune of the war was entirely decided in favour of the Adeliens and Turks; the emperor was defeated in every battle, and frequently hunted from place to place like a wild beast. The Moors, finding at last no necessity for keeping up an army, over ran the whole empire in small parties, every where plundering and burning the towns and villages, and carrying off the people for slaves.

130

The Ade-
liens assist-
ed by the
Turks.

131

The empe-
ror every
where de-
feated and
reduced to
great di-
stresses.

This destructive war continued till the year 1537; when Gagné sent a message to the emperor, exhorting him not to fight any longer against God, but to make peace while it was in his power, and give him his daughter in marriage: on which condition he would withdraw his army; but otherwise he would reduce his empire to such a state that it should be capable of producing nothing but grass. David, however, still

refused to submit; replying, that he put his confidence in God, who at present only chastised him and his people for their sins; but that Gagné himself, being an infidel, and enemy to the true religion, could not fail of coming in a short time to a miserable end. This unsuccessful negociation was followed by several encounters, in which the emperor was constantly defeated; in one of them his eldest son was killed, and in another his youngest was taken prisoner: so that he now seemed entirely destitute, being obliged to wander on foot, and all alone, hiding himself throughout the day among the bushes on the mountains.

The invincible constancy with which this forlorn monarch bore his misfortunes, proved a matter of surprise both to friends and enemies. Many of his veteran soldiers, compassionating the distresses of their sovereign, fought him out in his hiding places; so that he once more found himself at the head of a small army, with which he gained some advantages that served to keep up his own spirits and those of his adherents. His greatest enemy was Ammer, one of Gagné's officers, who headed the rebellious Abyssinians, and who had formed a scheme of assassinating the king; but, instead of accomplishing his purpose, he himself was assassinated in 1538 by a common soldier, on what account we are not informed.

By the death of Ammer and the small successes which David himself had obtained, the affairs of Abyssinia seemed to revive; but still there was no probability of their being ever brought to a fortunate issue. An embassy to Portugal was therefore thought of in good earnest, as the mischievous effects of slighting the proffered friendship of that power were now sufficiently apparent. One of the attendants of Roderigo, named John Bermudes, who had been detained in Abyssinia, was chosen for this purpose; and to his temporal character of ambassador was added that of Abuna, primate or patriarch. John, who was not a clergyman originally, had received all the inferior ecclesiastical orders at once, that the supreme one might be thus conferred upon him; but happening to be a great bigot to the popish religion, he would not accept of his new dignity but with a proviso, that his ordination should be approved by the pope. This was indirectly submitting the church of Abyssinia to that of Rome; to which David would never have agreed, had it not been for the desperate situation of his affairs at that time. John was therefore allowed to do as he thought proper: when passing through Arabia and Egypt to Italy, he had his ordination confirmed by the pope; after which he set out on the business of his embassy. On his arrival at Lisbon, he was acknowledged by the king as patriarch of Alexandria, Abyssinia, and of the sea; for this last title had also been conferred upon him by his Holiness. Entering then upon the purpose of his embassy, he began by putting Zaga Zaab in irons for having wasted so much time, and done nothing effectual since he had left Abyssinia. Then he represented to the king the distresses of the Abyssinians in such a strong light, and insisted so violently for relief to them, that an order was very soon procured for 400 musketeers to be sent by Don Garcia de Noronha to their relief. To accelerate the progress of the intended succours, John

Ethiopia.

Refuses to
submit.

133

A new em-
bassy to
Portugal.

134

A body of
Portuguese
ordered to
be assist the
emperor.

Ethiopia.

himself proposed to sail in the same fleet with Don Garcia; but his voyage was delayed for a whole year by sickness, occasioned, as he supposed, by poison given him by Zaga Zaab, the monk whom he had imprisoned, and who had been set at liberty by the king. After his recovery, however, he set sail for India, where he arrived in safety. The death of Don Garcia, which happened in the mean time, occasioned another delay; but at last it was resolved that Don Stephen de Gama, who had succeeded to Don Garcia, should undertake an expedition to the Red Sea, in order to burn some Turkish galleys which then lay at Suez. But intelligence having in the mean time been received of the intended voyage, these vessels had withdrawn themselves. Anchoring then in the port of Masuah, Don Stephen sent over to Arkeeko on the continent to procure fresh water and other provisions; but the Turks and Moors being now entirely masters of that coast, the goods he had sent in exchange were seized without any thing being given in return. A message was brought back, importing, that the king of Adel was now master of all Ethiopia, and consequently that no trade could be carried on without his leave; but if Don Stephen would make peace with him, the goods should be restored, a plentiful supply of water and all kinds of provisions granted, and amends likewise made for 60 Portuguese who had been killed at Zeyla. These had run away from the fleet on its first arrival in the Red Sea, and landed on the coast of Adel, where they could procure no water; of which the barbarians took advantage to decoy them up the country; where, having persuaded them to lay down their arms, they murdered them all. To this Don Stephen returned a smooth answer, sent more goods, obtained provisions, and promised to come ashore as soon as a Mahometan festival, which the savages were then celebrating, should be over. This treaty was carried on with equal bad faith on both sides; but Don Stephen had now the advantage by obtaining the provisions he stood in need of. These were no sooner brought on board, than he strictly forbade all intercourse with the land; and choosing out 600 men, he attacked the town of Arkeeko, killed the governor, and sent his head to the Abyssinian court; massacring at the same time all the people in the town he met with.

¹³⁶
Affairs of
Abyssinia
during this
interval.

¹³⁷
Royal fami-
ly massac-
red.

¹³⁸
Death of
David, and
accession of
Claudius to
the empire.

During this long interval a considerable change had taken place in the Abyssinian affairs. We have already seen that David had been reduced to great distress; but afterwards met with some little successes, which seemed to indicate an approaching change of fortune. In these, however, he was soon disappointed. A Mahometan chief called *Vizir Mugdid* made an attack upon the rock Geshen, where the royal family were kept; and finding it entirely unguarded, ascended without opposition, and put every person to the sword. This last disaster seems to have been too great for the resolution even of this heroic prince, as he died the same year 1540. He was succeeded by his son Claudius, who, though then but about 18 years of age, was endowed with all the great qualities necessary for managing the affairs of the empire in such a dreadful crisis, and had made considerable progress before the arrival of the Portuguese.

On his accession, the Moors despising his youth, instantly formed a league among themselves to crush him at once; but, like almost all others too confident of victory, they neglected to take the proper precautions against a surprise. This was not unobserved by Claudius; who falling upon one party which lay next to him, gave them a total defeat. The king pursued them the whole day of the engagement, the ensuing night, and part of the following day; putting to death without mercy every one who fell into his hands. This excessive ardour very much damped the spirits of his enemies, and at the same time inspired his own party with the most sanguine hopes of success; whence he soon appeared at the head of such an army as convinced his enemies that he was by no means to be despised. They now found it necessary to desist from the practice they had so long continued of plundering and ravaging the country; to call in their scattered parties, unite their troops, and spend the rainy season in such parts of Abyssinia as they had conquered, without returning into Adel as had hitherto been usual with them. They now came to a resolution to force the king to a general engagement, in which they hoped to prove victorious by dint of numbers. For this purpose all the rebel chiefs in Abyssinia were called in, and a formidable army collected. They waited only for one very experienced chief named *Jonathan*; after whose junction they determined to attack the royal army without delay. But Claudius took his posts at all times with such judgment, that any attempt upon his camp would have been almost desperate; and getting intelligence where *Jonathan* lay with his forces, he marched out in the night time, came upon him quite unprepared, defeated and killed him, sending his head to the rest of the confederacy by a prisoner, the only one he had spared out of all those who were taken. By the same messenger a defiance was sent to the Moors, and many opprobrious epithets were bestowed upon them; but though the armies approached one another, and continued for several days under arms, the Moors were so much intimidated that they would by no means venture an engagement.

By this victory the spirits of the Abyssinians were so much elevated, that they flocked in from all parts to join their prince; and even many of the Mahometans, having experienced the lenity of the Christian government, chose rather to submit to Claudius than to the Turks and Adeliens. The king, however, was in danger of being assassinated by one *Ammer*, a treacherous governor; who knowing that he had retired to some distance from his army to celebrate the festival of Easter, attempted to surprise him when almost destitute of attendants; but Claudius having timely notice of his designs, laid an ambush for him with a considerable part of his army which he headed in person. The rebel, not being equally well informed, fell into the snare, was defeated, and almost his whole army cut off on the 24th of April 1541.

Matters were in this situation when the Portuguese arrived, as has already been related. The head of the governor of Arkeeko had been received by the queen, who considered it as an happy instance of the valour of her allies, and as a presage of future victories. The Portuguese admiral, Don Stephen de Gama, lost no time in employing the men allowed by the king to

Ethiopia.

¹³⁹

A powerful

league

formed a-

gainst the

new empe-

ror.

¹⁴⁰

The Moors

defeated.

¹⁴¹*Jonathan*, a

rebel chief,

defeated

and killed.

¹⁴²

Unsuccess-

ful attempt

to assassi-

nate *Claudius*.

¹⁴³ ^{Ethiopia.} assist the Abyssinians. These were in number 450; but as the officers who commanded them were all noblemen of the first rank, the army was considerably increased by the number of their servants. The supreme command was given to Don Christopher de Gama the admiral's youngest brother. Almost every man on board, however, was ambitious to share in the glory of this enterprise; whence great complaints were made by those who were not allowed to go: and hence, Mr Bruce informs us, the bay in the island of Masuah, where the admiral's galley rode, had the name of *Bahia dos Agravados*; the bay of the injured, not of the sick, as has been erroneously supposed.

¹⁴⁴ ^{The Portuguese} This gallant army instantly set forward by the most easy road through the Abyssinian territories, in order to join the emperor. Still, however, the way was so rugged, that the carriages of their artillery gave way, and they were therefore obliged to construct new ones as they went along, splitting the barrels of old muskets to furnish them with iron, that commodity being very scarce in Abyssinia. In this journey the general was met by the empress, attended by her two sisters and a great many others of both sexes, whom he saluted with drums beating and colours flying, accompanied by a general discharge of the fire-arms, to their great confusion and terror. Her majesty, whose person was entirely covered, indulged the Portuguese general with a view of her face; and after a mutual exchange of civilities, the queen returned with 100 musketeers appointed by him as her guard. After eight days march, through a very rugged country, Don Christopher received a defiance in very insulting terms from Gragné the Mahometan general, which was returned in the same style. An engagement took place on the 25th of March 1542; in which little was done by either party besides wounding both the commanders: however, Gragné, though greatly superior in horse, had already felt so much of the Portuguese valour, that he did not choose to venture a second battle.

¹⁴⁶ ^{Battle between the Portuguese and the Moors.}

¹⁴⁷ ^{Don Christopher rashly engages at a disadvantage.}

As the season was now far advanced, the Portuguese put themselves into winter-quarters; while Gragné remained in their neighbourhood, in hopes of forcing them to a battle before they could be joined by the king, who advanced for the purpose as fast as possible. This being the case, it was to the last degree imprudent in Don Christopher to think of venturing an engagement without previously forming a junction with his royal ally; especially as Gragné had now doubled the number of his horse, increased his train of artillery, and otherwise received considerable reinforcements. Unfortunately, however, the Portuguese general suffered himself to be hurried away by the impetuosity of his own temper; and paying regard to the defiances and reproaches of a barbarian whom he ought to have despised, was induced, contrary to all advice that could be given, to venture an engagement at a vast disadvantage. Yet when the armies encountered each other, the superiority of the Portuguese was so great, that victory seemed likely to be decided in their favour. On this Gragné ordered some artillery to be pointed against the Abyssinian allies. These, entirely unaccustomed to fire-arms, fled almost at the first discharge. Gragné, well knowing that it was his interest to destroy the Portuguese, who were only 400 in number, ordered no pursuit against the Abyssinians, but fell with his

whole force upon the Europeans. Even yet his success was doubtful, till Don Christopher, exposing himself too much, was singled out and shot through the arm. This produced such confusion, that a total defeat, with the loss of the camp, ensued; when the barbarians, according to custom, put to death all the wounded, and began to abuse the women, who had all retired into the tent of the general. This being observed by a noble Abyssinian lady married to one of the Portuguese, she set fire to some barrels of gunpowder which happened to be in the tent, and thus perished along with her ravishers.

Don Christopher, who by his rashness had occasioned this disaster, obstinately refused to fly, till he was put into a litter by force, and sent off along with the queen and patriarch, who happened to be present. The two latter had set off before the battle; but Don Christopher sent some horsemen in pursuit of them, by whom they were brought back, and reproached by the general for the bad example they had shown to the army. Arriving at the approach of night in a wood where there was a cave, Don Christopher entered it to have his wound dressed, but obstinately refused to proceed farther. Next day he was taken; betrayed, as is most probable, by a woman whom he loved; who is said to have pointed out this cave to him, and promised to send some friends to convey him into a place of safety. Instead of this, a party of the enemy entered the cave; and on his readily informing them of his name, they instantly carried him in triumph to Gragné. Here, after several insults had passed on both sides, the barbarian, in a fit of passion, cut off his head; which was sent to Constantinople, and his body cut in pieces and dispersed through Abyssinia.

This cruelty of Gragné proved more detrimental to his cause than a complete victory gained by the other party could have been. On the one hand, the Portuguese were so exasperated by the loss of their leader, that they were ready to embark in the most desperate undertakings, in order to revenge his death; on the other, the Turks, on whom he principally depended, were irritated to the last degree at the disappointment of sharing his ransom, which they imagined would have been an immense sum; and therefore abandoned their leader to return to their own country. Gragné, thus left to decide the quarrel with his Africans, was quickly defeated by Claudius; and in another engagement which took place on the 10th of February 1543, his troops were defeated and himself killed. This last misfortune was owing to his boldness in advancing before his army which was giving way, so that he became known to the Portuguese. On this he was singled out by a Portuguese named *Peter Lyon*, who had been valet de chambre to Don Christopher. This man, to make his aim more sure, crept for a considerable way along the bank of a river towards the place where Gragné was; and when come sufficiently near, shot him quite through the body. Finding himself mortally wounded, he quitted the field of battle; and was followed by Lyon, who in a short time saw him fall from his horse. He then came up to him, and cut off one of his ears, which he put in his pocket, and returned to the battle to do what further service he could. The next day Gragné's body was found by an Abyssinian officer, who cut off his head and claimed the merit of killing him; but Lyon having pulled

Ethiopia.

¹⁴⁸ ^{Is wounded and defeated.}

¹⁴⁹ ^{Takes shelter in a cave, is taken and put to death.}

¹⁵⁰ ^{Gragné abandoned by his allies, is defeated and killed.}

¹⁵¹ **Ethiopia.** out the ear which he carried in his pocket, vindicated his own right to the reward which was to be given to the other. On this occasion the Moorish army was almost entirely destroyed; Gragné's wife and son were taken prisoners, with Nur the son of Mugdid, who destroyed the royal family; and it had been happy for Claudius, as we shall afterwards see, that he had put these prisoners to death. Very soon after this engagement, the emperor had intelligence that Joram, a rebel chief, who had once reduced his father David to great distress, was advancing rapidly in hopes of being still able to be present at the battle. This was the last of his father's enemies on whom Claudius had to revenge himself; and this was effectually done by a detachment of his army, who posted themselves in his way, fell upon him unexpectedly, and cut him in pieces with all his men.

¹⁵¹ Joram a rebel chief defeated and killed.

¹⁵² Disturbances on affairs of religion.

¹⁵³ Altercation betwixt the emperor and the patriarch Bermudes.

Claudius being now freed from all apprehension of foreign enemies, began to turn his thoughts towards the reparation of the damages occasioned by such a long war, and the settlement of religious affairs. We have already mentioned, that John Bermudes was appointed by the pope, as he said, patriarch of Alexandria, Abyssinia, and of the sea. This, however, is said by others to have been a falsehood; that John was originally ordained by the old patriarch of Abyssinia; and that the pope did no more than give his sanction to this ordination, without adding any new one of his own. But whether this was so or not, certain it is, that John, who was very insolent in his behaviour, and of a turbulent disposition, now began to insist that Claudius should not only embrace the doctrines of the church of Rome, but establish that religion throughout the empire, which he said his father David had engaged to do; and which, considering the extreme distress in which he was involved, it is very probable that he did. Claudius, however, was of a different opinion, and refused to alter the religion of the country; upon which a contention began, which was not ended but by the total expulsion of the catholics, and the cutting off all communication with Europeans. At that time the Portuguese and Abyssinians intermarried, and attended religious worship promiscuously in each others churches: so that the two nations might have continued to live in harmony, had it not been for the misbehaviour of Bermudes. Claudius, perceiving the violence and overbearing disposition of the man, took every opportunity of showing his attachment to the Alexandrian or Greek church; denying that he had made any promise of submitting to the see of Rome. On this Bermudes told him that he was accursed and excommunicated; the king in return called him a Nestorian heretic; to which Bermudes replied by calling him a liar, and threatened to return to India, and carry all the Portuguese along with him. To this insolent speech Claudius answered, that he wished indeed that Bermudes would return to India; but that he would not allow the Portuguese, nor any person, to leave his territories without permission.

Thus matters seemed likely to come to an open rupture; and there can be no doubt that the worst extremities would have followed, had not the emperor been restrained by the fear of the Portuguese valour on the one hand if he should attempt any thing against them, and the hopes of further advantages should he retain them in his service. For these reasons he bore with

patience the insults of the patriarch; attempting to gain the rest of the Portuguese over to his side. He succeeded perfectly with their commander Arius Dias; who privately renounced the church of Rome, and was baptized into that of Abyssinia by the name of *Marcus* or *Marco*; in consequence of which, the emperor, looking upon him as a naturalized subject, sent him a standard with the Abyssinian arms to be used instead of those of Portugal. This, however, was not delivered; for a Portuguese named *James Brito*, meeting the page who carried it, took it from him and killed him with his sword. The apostacy of Arius is said to have been owing to the great honours which had been conferred upon him by the Abyssinian monarch: for having, in an expedition against Adel, defeated and killed the king and taken the queen prisoner, he bestowed her in marriage on Arius; and that the match might be equal, he raised him also to the royal dignity, by giving him the kingdoms of Doar and Belwa.

Ethiopia.

¹⁵⁴ The Portuguese command-er renounces the Ro-mish religion.

¹⁵⁵ He is invested with royal dignity.

The altercation on the subject of religion becoming every day more violent, Bermudes was prohibited by the emperor from sending any farther orders to the Portuguese, they being now under the command of Marco the Abyssinian captain-general; meaning Arius Dias, to whom the name of Marco had been lately given. To this the patriarch replied, that being subjects of the king of Portugal, they were under no obligation to obey a traitor to his king and religion; and that since his majesty still persisted in refusing to submit to the pope, he was resolved to leave the empire with his forces. The emperor, however, still insisted that he was absolute in his own dominions; and he expected the Portuguese to pay obedience to his general, and none else. The Portuguese, enraged at this declaration, resolved to die sword in hand rather than submit to such terms; and therefore began to fortify their camp in case of any attack. The emperor, on this, thinking a defiance was given him in his own territories, ordered the camp to be instantly attacked. The attempt was accordingly made, but with very little success; the Portuguese having strewed the ground with gunpowder, set fire to it as the Abyssinians marched along, which destroyed great numbers, and intimidated the rest to such a degree that they instantly fled. Finding it vain to think of reducing them by force, the emperor is then said to have been advised by Marco to consult his own safety, and break the power of the Portuguese by artifice. With this view he sent for the patriarch, pretended to be very sorry for his frequent breach of promise, and desirous to make what amends for it he could. Instead of complying with the patriarch's demands, however, he first ordered his subjects to supply them with no provisions: then he stopped the mouths of the Portuguese by a considerable quantity of gold, giving the patriarch himself a very valuable present; adding to all this a large supply of provisions; but at the same time taking proper methods to disperse their leaders into different parts of the empire, so that they should find it impossible ever to reunite in a body.

¹⁵⁶ Hostilities betwixt the Abyssinians and Portuguese.

Such is the account given of this transaction by the Portuguese historians; but that of Mr Bruce, who says that he translated his from the Abyssinian annals, is somewhat different. He only informs us, that the quarrel betwixt the Portuguese and Abyssinians was inflamed by the "incendiary spirit of the brutish Bermudes: from

¹⁵⁷ ^{Ethiopia} from reproaches they came to blows; and this proceeded so far, that one night the Portuguese assaulted the king's tent, where they slew some and grievously wounded others." The event, however, was, that no absolute quarrel ever took place betwixt this emperor and any of the Portuguese excepting this patriarch, whom he was on the point of banishing to one of the rocks used as prisons in Abyssinia. This was dispensed with on the interposition of Gaspar de Suza the new Portuguese commander (who had succeeded Arius Dias), and another named *Kasmati Robel*, both of whom were in great favour with the emperor; and Bermudes persuaded to withdraw to India. According to Mr Bruce, he repaired to Dobarwa, where he remained two years quite neglected and forlorn, saying mass to no more than ten Portuguese who had settled there after the defeat of Don Christopher. He then went to Masuah; and the wind soon becoming favourable, he embarked in a Portuguese vessel, carrying with him the ten persons to whom he had officiated as priest. From Goa he returned to Portugal, and continued there till his death. On the other hand, the Portuguese writers inform us, that he was narrowly watched by order of the emperor; and that Gaspar de Suza, the Portuguese commander, had orders to put him to death if he should attempt to make his escape. Bermudes, however, being determined at all events to make his escape, pretended to be ill of the gout, and that a change of air was necessary for his recovery; for which reason he went to the town above mentioned, where there was a monastery. On this pretence he was allowed to cross the kingdom of Tigré, accompanied by eight faithful servants, with whom he reached Dobarwa unsuspected. Here he remained concealed in a monastery for two years before he could find an opportunity of getting to the island of Masuah, from whence he proceeded to Goa.

¹⁵⁸ A new deputation from the pope.

The emperor was scarce freed from this troublesome priest, when he was in danger of being involved in new difficulties by the intrusion of others into his dominions. Ignatius Loyola, founder of the order of the Jesuits, was at that time at Rome; and so much attached to the cause of the Pope, that he proposed to go in person to Abyssinia, in order to make a thorough conversion of both prince and people. His Holiness, however who, from what he had already seen of Ignatius, conceived that he might be of greater use to him by staying in Europe, sent in his stead Nugnez Baretto, one of the society of Jesuits, whom he invested with the dignity of patriarch, and honoured with a letter to Claudius. With these commissions, and a number of priests, Baretto sailed for Goa in the East Indies; by which, however distant, the only passage to Abyssinia was at that time. On his arrival at that place he was informed that the Abyssinian monarch had such a steady aversion to the church of Rome, that there was no probability of his meeting with a favourable reception. For this reason it was judged more proper to send some clergymen of inferior dignity, with proper credentials, as ambassadors to the emperor from the governor of India, without running the risk of having any affront put upon the patriarch. These were Oviedo bishop of Hierapolis, Carneyro bishop of Nice, and several others, who arrived safely at Masuah in the year 1558. Claudius, on hearing of their arrival, was greatly

pleased, as supposing that a new supply of Portuguese soldiers were arrived. Finding, however, that they were only priests, he was very much mortified, but still resolved to give them a civil reception. But a more important consideration, and which concerned the welfare of the empire in the highest degree, now claimed his attention. This was the appointment of a successor to the throne, Claudius himself having no son. A project was therefore set on foot for ransoming Prince Menas, the emperor's youngest brother, who had been taken prisoner by the Moors in the time of David, and hitherto detained in captivity on a high mountain in Adel. This was not likely to be accomplished; for the Moors would not willingly part with one who they knew was their mortal enemy, that he might be raised to the sovereignty of a great empire. By detaining him prisoner also, they might reasonably hope for disputes concerning the succession to the Abyssinian throne; which would enable them to attack the empire with advantage. In these circumstances, it is probable that Claudius would have found great difficulty in procuring his brother's liberty, had it not been that the son of the famous Gragné had been taken in that battle in which his father was killed, and in like manner confined on a mountain in Abyssinia. A proposal was then made to his mother, who had escaped into Atbara that her son should have his liberty, provided the king's brother should be restored. This was accepted; and by means of the bashaw of Masuah, an exchange was made. Four thousand ounces of gold were given for the ransom of Menas, which were divided between the Moors and the bashaw of Masuah; while on his part Claudius set at liberty Ali Gerad the son of Gragné without any farther demand.

According to Bermudes's account of these times, the widow of Gragné was taken prisoner at the battle in which her husband was killed, and was afterwards married to Arius Dias. In this case we must suppose her to have been the same with the *queen of Adel*, mentioned as his consort by other historians: but Mr Bruce treats this account as a mere fable; and informs us, that by means of Nur the son of Mugdid, murderer of the royal family as already related, she made her escape into Atbara. On that occasion Nur fell in love with her; but she refused to marry any man unless he brought her the head of Claudius, who had killed her former husband. To attain his wishes therefore, Nur, now governor of Zeyla, undertook the task; and when Claudius marched towards Adel, sent him a challenge to fight; telling him that there was yet a particular instrument for shedding the blood of the Abyssinian princes, and desiring him to be prepared, as he was very soon to set out to attack him. The emperor did not decline the combat, but is said to have been advised against this expedition by all his friends. This advice seems to have proceeded from a number of prophecies, probably trumped up by the clergy, that he should be unfortunate, and lose his life in the campaign. These prophecies ought no doubt to have had weight with him, as they most certainly indicated a spirit of disaffection among his troops; and the event accordingly evinced that it was so. The Abyssinians fled almost on the first fire, leaving the king in the midst of his enemies, attended only by 18 Portuguese and 20 horsemen of Abyssinia, who continued faithful to the last.

¹⁵⁹ ^{Ethiopia} Prince Menas redeemed from captivity.

¹⁶⁰ Nur determined to destroy Claudius.

¹⁶¹ Defeat and death of the emperor.

Ethiopia.

All these were killed after the most desperate resistance; the king himself receiving upwards of 20 wounds before he fell. His head was cut off, and brought by Nur to his mistress, who hung it up on a tree before her door. Here it remained for three years, when it was at last bought by an Armenian merchant, who buried it at Antioch in the sepulchre of a saint of the same name. Nur gained on this occasion a very complete victory; the king and most of the principal nobility being killed, a great number made prisoners, and the camp taken with an immense booty. On his return to Adel, he refused to accept of any congratulations, or to allow rejoicings to be made for his victory, but passed along in the habit of a common soldier mounted on an ass; saying, that he owed the victory to the mercy of God alone, who had immediately interposed for the destruction of the Christian army.

162
Reign of
Menas.

This fatal engagement took place on the 22d of March 1559; and as the successor had been already settled, Menas ascended the throne without any opposition. On his accession he found his affairs in great confusion, and he had still to contend with foreign and domestic enemies. The first of these was Radaet the king of the Jews, who had a territory in the empire of Abyssinia, the capital of which was on a rock named *Samen*. The cause of this quarrel is not known, but the event was unfortunate; the king being obliged to abandon the enterprise, after having bestowed a considerable time upon it. This was followed by an attempt to assassinate him, which had very near taken place; and this again by a conspiracy among his principal nobles headed by Isaac the Baharnagash. He had been a very faithful servant of the late emperor Claudius; but ill used by Menas, who was of a very haughty and morose disposition. In attempting to suppress this rebellion, the first attempts of the emperor were likewise ineffectual, his forces being attacked by surprise and entirely defeated. Soon after this, Isaac proclaimed Tascar the nephew of Menas, who was then at liberty, king of Abyssinia; hoping thereby to strengthen his cause, and enable him to cope with the emperor, who was assembling a powerful army against him. This expedient did not answer the purpose. His army was entirely defeated by Menas; Tascar taken prisoner, and thrown headlong from the top of a precipice; and Isaac himself escaped with great difficulty to the confines of his own government in the neighbourhood of Masuah. Here he entered into an alliance with the Turkish bashaw of Masuah; whose friendship he gained by putting him in possession of the town of Dobarwa, with the flat country adjacent, which abounds with the provisions wanted at Masuah, and is looked upon as the key to the province of Tigre and the high-lands of Abyssinia. Besides this, Isaac strengthened himself also by an alliance with the Portuguese; which, had their numbers been at all considerable, must have been very formidable. Their inclination to desert their former protector and ally the emperor, proceeded entirely from the shameful behaviour of their priests, who never would be satisfied without enslaving the emperor as well as his subjects to the tyranny of Rome. We have already seen that Bermudes had proceeded so far on this subject, that he narrowly escaped with his life. His successor Oviedo (for the patriarch Nugnez died by the way) fared still worse. On his introduction to the

163
Rebellion of
Isaac the
Baharnagash.

164
He is de-
feated.

165
Allies with
the Turks
and Portu-
guese.

166
Reason of
their quar-
rel with the
emperor.

emperor Claudius, he informed him, that the pope and king of Portugal now expected no less than an immediate fulfilment of his engagements of submission to the see of Rome. This requisition was made with such an air of insolence, that the prince could scarce conceal his resentment; but restraining his passion, he promised to consider of it, and to call meetings of the learned in these matters to debate the point. This was a very fruitless task; and therefore Oviedo thought proper to quit the court towards the end of December 1558; leaving behind him an insolent letter addressed to the Portuguese and such converts as they had made; in which he exhorted them not to converse with schismatics, and the Abyssinians to forsake their errors. Being now debarred from access to the emperor, he began to entertain the people with seditious discourses; which practice he continued during the remaining part of the reign of Claudius and the beginning of that of Menas. The latter, perceiving the pernicious tendency of his discourses, positively commanded him to desist; which the patriarch refusing, the emperor fell upon him with his own hands, beat him severely, tore his clothes and beard, and took his chalice from him that he might thus be disabled from saying mass; after which he banished him, with Francis Lopez another of his associates, to a barren mountain, where they remained seven months in great misery. Not content with this, he issued many severe edicts against the Portuguese; prohibited them from intermarrying with the Abyssinians; and such of the Abyssinian women as were already married to Portuguese husbands, he commanded not to accompany them to their churches. His next step was to call Oviedo again into his presence, and command him, under pain of death, instantly to leave his dominions. The insolent and foolish priest refused obedience to this express command; he declared that he would obey God rather than man; and presenting his bare neck to the emperor, desired him to strike and put an end to his life at once. Menas drew his sword, but was prevented by the queen and officers who stood near him from giving the fatal stroke. A second beating and banishment to the mountain succeeded; and in the latter part of the sentence all the Portuguese priests as well as others were included. The Portuguese, however, determined not to submit to such an indignity; and therefore, to a man, joined Isaac; who, in expectation of more auxiliaries from India, professed a great desire of embracing the Romish religion. The king was very apprehensive, and not without reason, of the arrival of more Portuguese; but it appears that Oviedo had not sufficient interest to procure the supply he promised. An engagement, therefore, took place without them, in which Menas was again victorious; though the battle was not so decisive as to put an end to the rebellion.

The emperor died a short time after his victory, and was succeeded in 1563 by his son Sertza Denghel, then only 12 years of age. The beginning of his reign was disturbed by new rebellions; which, however, were happily suppressed. Isaac, with his allies the bashaw and the Portuguese, seem to have remained for some time unmolested; and in the year 1569, a kind of accommodation took place. It is by no means easy to say how the Portuguese were again received into favour after such flagrant treachery and rebellion. Mr.

Bruce.

Ethiopia.

167
Oviedo ban-
ished to a
mountain.

168
Is com-
manded to
leave the
empire,
but refuses.

169
Sentence of
banishment
passed on all
the Portu-
guese, who
thereupon
join the
rebels.

170
Isaac again
defeated.

171
Reign of
Sertza
Denghel.

^{Ethiopia.} Bruce only simply tells us that "Oviedo and the Portuguese did not appear at court." This indeed is not to be wondered at, as they had been so lately at open war with the emperor. Other accounts say, that after the last battle with Isaac, "their name became so odious to all the Abyssinians, especially to their monarchs, that they would never suffer any of them to be in their army from that time." Some of these accounts say also, that Menas was defeated and killed in another battle; others, that he was driven to some high mountains, where he wandered about till death put an end to his misery. Accounts of this kind, however, are by Mr Bruce treated as mere falsehoods, and expressly contradictory to the annals of those times. All we can say upon the subject therefore is, that after the defeat of Isaac, the Portuguese, not excepting Oviedo himself, remained in Abyssinia, where they were more favourably dealt with by the new emperor than they had been by his father; though he was no friend to their religion, as supposing it to be destructive of monarchy and all civil government. It is probable also, that the various disturbances which happened, together with his own tender age during the beginning of his reign, would prevent him from paying that attention to them which he would otherwise have done. The Galla, a very barbarous nation, and who have at last greatly reduced the power of the Ethiopian monarchs, made frequent inroads during this reign; and in the

¹⁷² Isaac and the Bashaw Adel, with Isaac and the Turkish bashaw, who had league with ther continued their hostilities, or renewed them about the king of this time. The emperor, however, marched with such expedition, that he did not allow them time to join their forces; and attacking them separately, gained a complete victory over them all. Almost the whole

¹⁷³ Moorish army was destroyed; but while the emperor entered Adel with a design to make a full end of his enemies on the east, he received information that the Galla had invaded him on the west. Traversing the whole breadth of the empire therefore with the utmost expedition, he came up with these enemies, who were afraid to encounter him. On this he turned his arms against the Falasha, obliging them to deliver up their king, whom he banished to a mountain. Then invading the country of the Galla and Falasha, he ravaged it for four years successively, protecting at the same time the kingdom of Narea from the inroads of these barbarians.

¹⁷⁵ While Sertza Denghel employed himself in repressing the incursions of the Galla, one Cadward Basha, a Turkish officer of great valour and experience, who had been invested with the office of bashaw of Masuah, began to make inroads into the province of Tigré. The emperor hastened to oppose him; but in his passage committed great devastations in the country of the Falasha, in order to provoke them to descend from their mountains and come to an engagement. These Falasha profess the Jewish religion, and were then governed by a king named *Gesken*. This monarch, provoked at the ravages and destruction he beheld, descended with vast numbers of his subjects, in order to revenge it; but was killed, and his army utterly defeated by the Abyssinians, on the 19th of January 1594. The victorious Sertza then hastened to encounter the bashaw; who, confident of the superiority of his

¹⁷⁶ King of the Falasha defeated and killed.

own troops, not only waited him patiently, but gave him every advantage he could desire. A very desperate battle ensued; the event of which was doubtful, till Robel, commander of part of the king's household troops, who were armed with pikes, attacked that part of the Turkish horse where he saw the bashaw, and killed the officer who carried the standard. In doing this he broke his pike; but though then destitute of any other weapon than a short crooked knife which the Abyssinians always carry in their girdles, he instantly pushed up to the bashaw, and with it wounded him mortally in the throat. This unexpected event instantly decided the victory; the Turkish horse betook themselves to flight, and the rest of the army soon followed their example. A dreadful slaughter ensued among the Moors, who were pursued to the island of Masuah; and many were driven into the deserts, where they perished with thirst. After this, marching back to the western part of his territories, the emperor proceeded to Narea, destroying the Galla as he went along. His last expedition was towards Damot to chastise some rebels there. Before he set out, a priest of great sanctity and talent for divination, is said to have warned him not to undertake the war; but his advice was rejected with contempt: on which he requested him only not to eat the fish taken out of a certain river; but this advice was also neglected, and the fish being really of a poisonous nature, the king died in consequence of eating them.

On the death of Sertza Denghel a dispute ensued about the succession. In the beginning of his sickness the late king had named for his successor his son Jacob, a boy of only seven years of age; but finding death approaching, he named his nephew Za Denghel, as being come to the years of manhood, and more fit for the government of such a numerous and turbulent people. This last resolution proved highly disagreeable to the queen and some of the principal nobility, who wished for a minority, during which they might engross the power into their own hands. In conjunction with her two sons-in-law, Kessa Wahad and Ras Athanasius, therefore, the empress determined to raise Jacob to the throne, notwithstanding the final determination of the late king abovementioned. This was put in execution immediately after the death of Sertza Denghel; Jacob was raised to the throne, and Za Denghel confined in an island of the lake Dembea or Tzana. An attempt was likewise made to seize Socinios, natural son to Facilidas grandson of the unfortunate David, who had likewise a claim to the throne; for his not being born of a lawful marriage, was no objection in Abyssinia. Socinios, however, no sooner saw the fate of his cousin Za Denghel, than he withdrew himself from the power of his enemies; and Za Denghel himself, after being a short time confined in the island above mentioned, found means to escape, and took refuge among the inaccessible mountains of Gojam.

Thus disappointed in their attempts on the princes, the empress, with her two sons-in-law, were obliged to pretend loyalty to Jacob, whom they governed till he was 17 years of age. The young king then perceiving that his tutors were taking some steps to prolong their dominion over him, took the government into his own hands, and banished one Za Selasse, whom they had employed in the execution of their projects,

¹⁸¹ **Ethiopia.** to the kingdom of Narea. The conspirators, alarmed at this bold exertion of royal prerogative, determined instantly to depose Jacob, and raise Za Denghel, whom they had banished, to the throne. This, however, was now a matter of some difficulty, as he had concealed himself so effectually among the mountains of Gojam, that he could scarce be found out. His retreat being at last discovered, Ras Athanasius took an opportunity of insulting Jacob, even while sitting on the throne; called him an obstinate, stubborn, and foolish boy; declared him degraded from the imperial dignity, and that Za Denghel was coming to supplant him. Jacob, perceiving by the insolence of this speech, that he was entirely in the power of his enemies, left his palace in the night, in order to fly to the mountains of Samen, where his mother's relations were, from whom he expected protection. He got to the borders of that country, but was there discovered, seized, and brought back to his rival, who was now seated on the throne. Za Denghel, however, with a clemency not very usual in Abyssinia, did not either put him to death, or mutilate him in such a manner as to render him incapable of afterwards enjoying the kingdom; but contented himself with banishing him for life to Narea.

¹⁸² **Jacob banished.**

¹⁸³ **Decline of the Romish religion in Abyssinia.**

¹⁸⁴ **Peter Paez restores it.**

¹⁸⁵ **He arrives at court.**

Za Denghel was no sooner settled on the throne, than he unluckily behaved in such a manner as to alienate the affections of his people from him entirely. This was occasioned by his attachment to the church of Rome. Ever since the time that the Portuguese had joined Isaac the Baharnagash, the entrance into Abyssinia had been shut up by the Turks, so that no new missionaries could have access; and all those who came with Oviedo being dead, the Romish religion had languished for want of preachers to support it. The last of these died in 1596; and all the rest having been dead some time before, little could be expected from the labours of a single person. Next year Melchior Sylvanus, a vicar of the church at Goa, was sent on a mission to Abyssinia; being supposed to be a proper person for this work, on account of his language and complexion, which might baffle the vigilance of the Turks. He entered without being suspected; but the great defeat given the Turks by Sertza Denghel already mentioned, had reduced their power so much, that less danger now attended this expedition than formerly, and other missionaries quickly followed.

The most learned, as well as the best qualified for the undertaking in every respect, was *Peter Paez*, who came to this country in the year 1600; and on his taking upon him the whole charge of the mission, Sylvanus returned to India. The new missionary did not at first affect to intrude himself on the emperor; but taking up his residence at the convent of Fremona in the province of Tigre, he first applied to the study of the learned language of the Abyssinians called *Geex*, and in which their books are usually written. In this he made such progress as quickly to surpass the natives themselves; after which he set up a school, where the children of the Portuguese and Abyssinians were taught promiscuously. The progress made by his scholars was so great, that he was spoken of at court, and recommended in the warmest terms to the emperor Jacob before his deposition. On this he was sent for, and appeared before the court in 1604; where, to

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the great dissatisfaction of the Abyssinian monks, he received such honours as are usually bestowed on men of the first quality. Next day, in a dispute before the king, two of his scholars, whom he had brought along with him, fairly vanquished the best theologians that could be found to oppose them. Mafs was then said in the Roman manner; and this was followed by a sermon, which in the purity and elegance of its diction (whatever the substance might be) excelled any thing that had ever been composed in the Abyssinian language.

Though Paez had been called to court by Jacob, yet Za Denghel was on the throne before he arrived, and it was he who witnessed the dispute and heard the sermon. He was so much charmed with the latter, that he instantly resolved to embrace the religion of the church of Rome; which resolution he soon after communicated to several of his friends, and even to Paez himself; but under an oath of secrecy. The emperor's own zeal, however, rendered this oath of no use; for in a little time he issued proclamations forbidding the observation of the Jewish Sabbath, and wrote letters to Pope Clement VIII. and Philip III. of Spain, desiring a supply of mechanics to instruct his people in the useful arts, and Jesuits to teach them religion.

This precipitate conduct had the effect which might have been expected. The Abyssinians were generally disaffected to the church of Rome, and no pains had been taken to gain them over: they were also turbulent, savage, and rebellious; ever ready to revolt; and now had a favourable opportunity of excusing their treasons under pretence of zeal for religion. This opportunity was quickly made use of by Za Selasse, whom, as we have already mentioned, Jacob had banished; but who, on the advancement of Za Denghel, had probably been set at liberty. This traitor having first held many seditious meetings in private, prevailed on the Abuna, or Abyssinian patriarch, to excommunicate the king, and absolve his subjects from their allegiance. He then set out for the territory of Gojam, where the people had always been remarkable for their aversion to the church of Rome. In this place, therefore, he found no difficulty in raising an army to fight against his sovereign. Za Denghel, who was an expert warrior, did not fail to go in quest of him with what forces he could raise; but soon found, by the great desertion among his troops as he passed along, how much the excommunication pronounced by the Abuna had availed. This was so alarming, that John Gabriel, an experienced Portuguese officer, advised him to decline an engagement for the present, and take shelter in some fortress until his subjects should return to a sense of their duty. This salutary advice was rejected, from the absurd notion that it was a dishonour not to fight a rebel who had defied his sovereign. In the beginning of the engagement, victory seemed to favour the royal cause. The Portuguese carried every thing before them, and routed that wing of the enemy which opposed them. In the other wing, however, the cowardly and treacherous Abyssinians deserted their king, who was quickly surrounded by his enemies, and left in a desperate situation. A body of nobility, with his own officers and domestics, attended him and fought desperately in his defence. Za Denghel himself, being an excellent horseman, and admirably

Ethiopia.

¹⁸⁶ **The emperor embraces the Catholic religion.**

¹⁸⁷ **His imprudent conduct occasions a rebellion.**

¹⁸⁸ **The emperor excommunicated.**

¹⁸⁹ **An army raised against him.**

¹⁹⁰ **He is abandoned by his troops and killed.**

Ethiopia. skilled in the use of arms, performed astonishing feats of valour. At last he was thrown to the ground, grievously wounded in the breast by a lance. Notwithstanding this, he instantly recovered himself, drew his sword, and resisted his assailants so violently, that they were fain to keep at a distance and annoy him with missile weapons. In this situation he stood till almost fainting with fatigue and loss of blood; when the traitor Za Selasse, pushing up his horse violently against him, threw him to the ground by a blow on the forehead, and a multitude then rushing upon him he was dispatched with many wounds.

191
His death
universally
lamented.

192
The empire
claimed by
Socinius.

193
He is ob-
liged to
retire.

194
Jacob set
up in op-
position to
him.

195
Bad con-
duct and
defeat of
Za Selasse
Jacob's ge-
neral.

The news of Za Denghel's death were received with such general indignation throughout the Abyssinian empire, that the rebels durst not name any successor. As it seemed natural to think, however, that Jacob would now be re-elected, messengers were dispatched to acquaint him of his good fortune; but during this interval Socinius appeared, not as a candidate, but as already in possession of the empire, and ready to support his rights by force of arms. His first step was to let Ras Athanasius know his pretensions to the throne, and desire his assistance with his army, promising to reward him as soon as it should be in his power. Without waiting for any answer, he advanced so rapidly, that Athanasius had scarce time to consider what he should reply, when a second message was sent, importing that Socinius was in the neighbourhood, and ordering preparations to be made for receiving him as his sovereign. This expeditious mode of action so much confounded Athanasius, that he complied with the requisitions, saluting him king, and joining his troops to his. Thus successful in his first attempt, Socinius made a similar one on Za Selasse. In this, however, he was disappointed. Za Selasse having first sent an equivocal answer, marched against him with his whole army; while Socinius, happening to fall sick, and putting little confidence in Athanasius, withdrew to the mountains of Amhara. Athanasius likewise, not knowing to whom he should attach himself, withdrew his forces, and stood neuter.

Za Selasse had refused to join Socinius, in expectation that Jacob would make his appearance, whom he rather wished to enjoy the crown than Socinius; as under the former he might hope to engross all the power to himself. For a long time, however, no answer was returned to his messages; his troops became impatient; so that fearing lest a mutiny or general desertion should take place, he dispatched a messenger to Socinius, acknowledging him for emperor. But scarce was this done, when a messenger arrived from Jacob, informing him that he was then in Dembea, and promising Za Selasse great honours if he would acknowledge him for his sovereign. With these terms the traitor instantly complied, and his example was followed by Athanasius; while Socinius, not as yet able to resist all his enemies, retired again to Amhara. This, however, he was not long of accomplishing. Jacob was by no means possessed of equal military skill; and though Za Selasse was an experienced officer, yet his extreme perfidy, pride, and obstinacy, rendered it very dangerous to have any concern with him. This appeared remarkably in the present case. His pride in the first place would not allow him to join his forces to those of Jacob, lest the latter, who was inferior in

military skill, should have a share in the victory he was to gain. Then, intoxicated with his opinion of himself, he neglected to behave with the caution necessary in the neighbourhood of such an experienced general as Socinius, which gave the latter an opportunity of cutting off almost his whole army. Being now obliged to fly with a few attendants to Jacob's camp, he met with an indifferent reception on account of his defeat; for which reason he made proposals to join Socinius. The latter accepted his offer, though he could put no confidence in one who had been guilty of such complicated treachery; only he thought it would be an advantage to put it out of his power to join his antagonist. Jacob, on the other hand, confident in his numbers, which are said to have been almost 30 to 1, advanced boldly to give his antagonist battle. Socinius declined the engagement till he had drawn him into a situation where his numerous forces could not act; so that a dreadful carnage ensued, Jacob himself perishing among the multitude, and his body being never found afterwards. In this battle also was killed the wicked priest Abuna Petros, who was the occasion of Za Denghel's death, as we have already related. Ras Athanasius escaped by the swiftness of his horse, and took refuge in a neighbouring monastery. He was afterwards pardoned at the intercession of Peter Paez; but his goods and estate being confiscated on various occasions, falling into universal contempt, and being abandoned by his wife, he died at last of want. According to the Abyssinian accounts, Socinius ordered the pursuit to be stopped as soon as he saw the head of Abuna Petros; but the Portuguese writers inform us, that he kept it up with the utmost vigour throughout the whole day and part of the night. They particularly mention, that a number of Portuguese, who had joined the army of Jacob, lost their lives on this occasion, by falling over a precipice which they could not avoid in the dark. One of these named *Manuel Goncalves* had the good luck to light on a tree, where he sat till morning in the utmost terror, but at last made a shift to clamber up and escape.

By this victory Socinius was fully established on the throne, though his situation might still be accounted precarious by reason of the rebellious disposition of many of the provinces. He began with making a general proclamation of pardon, excepting only the murderers of Za Denghel, with whom he had been in terms of intimate friendship. Being informed therefore, that one *Mahardin*, a Moor, had given him the first wound in that battle in which he was killed, he ordered his head to be instantly struck off with an ax before the gate of the palace.

The Portuguese were much favoured by this prince; and they were become very numerous by continual intermarriages with the Abyssinians; the male children being always trained to the use of fire-arms by their parents, and incorporated as soldiers with them; and they were now all united in one body under an experienced officer named *John Gabriel*, whom we have already had occasion to mention. As their numbers and valour made them objects of consideration, Socinius determined to attach them to himself as much as possible; and the best means to do this he knew was by favouring their priests. Peter Paez was therefore sent for to court; where a dispute concerning

Ethiopia.

196
Jacob de-
feated and
killed.

197
Socinius fa-
vours the
Portuguese.

Ethiopia. cerning the supremacy of the pope and the two natures of Christ (the great subjects of debate in Abyssinia), took place, and a sermon was preached with as great success as that in Za Dengehel's time. The king first enlarged the territory possessed by the Jesuits at Fremona; after which he declared to Paéz his resolution of embracing the Catholic religion; giving him at the same time two letters, one to the king of Portugal, the other to the Pope, the purport of which was to request a number of more Portuguese to deliver Abyssinia from the incursions of the Galla, as they had formerly done from the yoke of the Moors.

198 He resolves to embrace the Catholic religion.

199 An impostor, pretending to be the late emperor, Jacob appears.

200 Is defeated.

Before any thing of importance could be done in matters of religion, the king was called forth to suppress a rebellion which had already taken place. An impostor had appeared, who called himself *Jacob* the late king, and pretended to have escaped from the battle; but so much wounded in the face that he kept one side of it constantly covered to conceal the deformity. He made his appearance among the mountains of Habab near Masuah; and being joined by great numbers of people, Sela Christos, brother to the king, and governor of Tigré, marched against him. The impostor's troops, though numerous, fled at the first onset; but he escaped to the mountains, where it was very difficult to follow him. This, however, was attempted; and a great many of the posts he had taken were stormed like as many forts: but still the impostor himself, though driven from place to place, found means to make good his retreat to the country lying between the mountains of Habab and the territory of the Baharnagash. Thither he was pursued by Sela Christos; but that general, finding the rebellion likely to spread through the whole province of Tigré, thought proper now to acquaint his brother Socinios with the state of affairs, and to desire his assistance. The king, though at that time he had sent away most of his troops in an expedition against the Shangalla and Gongas, who dwell on the northwest of Abyssinia, set out immediately with such troops as he could collect. These were but few in number; his cavalry particularly, amounting to no more than 530, besides a small reinforcement brought by his brother Emana Christos, governor of Amhara. As he proceeded, he was informed that a party of Galla were lodged on a hill at no great distance from him. Determining to cut them off, he surrounded the hill where they were posted; but having caused his cavalry to advance before, and pass a deep ravine, they were almost entirely destroyed, while the rest of the army were seized with such a panic that they refused to stir. In this extreme danger, the Galla passed the ravine to attack them; but the king having advanced singly, and killed the first of them, his troops, ashamed of their cowardice, rushed forward on the enemy, and gained a complete victory, which obliged the savages to leave the province they infested at that time.

201 The Galla defeated.

202 The impostor Jacob again defeated.

The misfortune of the cavalry on this occasion quickly occasioned a report that the king had been defeated; of which the impostor Jacob did not fail to take advantage; and descending from his mountains, committed great devastations in the low country. But though attended by a great multitude, who likewise fought with more obstinacy than formerly, he was still defeated by Sela Christos with a force greatly inferior.

But before any thing effectual could be done for his reduction, the Galla made a dreadful irruption into the southern provinces, murdering all who fell into their hands, and burning and destroying towns, churches, and villages, in the most dreadful manner. The king bore those excesses for some time with patience, till at last he drew them into such a disadvantageous situation, that being surrounded by his forces, and inferior in number as well as in valour, they were all cut off to a man, with the loss of only 400 on the part of the Abyssinians. Soon after this victory the king underwent the ceremony of coronation. He then marched against the impostor Jacob; but the latter was too sensible of the superiority of his rival to face him in the field. He therefore retired again to his mountains, while the king left the suppression of the rebellion to an experienced officer named Amsala Christos; who employed two young men, that had been outlawed for murder, to assassinate the impostor. This being done, it was found that the pretended Jacob was no other than a herdsman among those mountains to which he so constantly fled for refuge; and that he had neither wound nor scar on his face, but had kept one half of it covered to conceal the little resemblance he bore to Jacob whom he personated.

The king being now freed from this rebellion, began again to turn his thoughts towards religion. His first step was to make an handsome present to the Jesuits; but he soon showed his inexperience in religious matters, by attempting to reconcile the two contending parties in his empire. Before he could see the folly of this attempt, however, his attention was called by a most dangerous rebellion, which was begun by one Melchizedec, a servant of the late Sertza Dengehel, but a man of great experience in war. He was first opposed by Sanuda, a brave officer; but being totally destitute of troops, he was obliged to apply to the attendants of the king of Sennaar, who had been deposed by his subjects, and was at that time in Abyssinia. These readily joined him; and a bloody battle ensued, in which Sanuda was so totally defeated, that he alone had the good fortune to escape, and that grievously wounded, his men being all killed on the spot. On this misfortune Socinios sent his brother Emana Christos with a considerable force to reduce the rebels. Melchizedec finding himself opposed by such an able general, exerted himself to the utmost, in order to raise a force sufficient to resist him; and in this he succeeded so well, that his army soon struck terror into all the neighbouring country, notwithstanding the presence and known valour of the king's brother. A prince of the blood-royal, named *Arzo*, was likewise found out and proclaimed king, in order to give some sanction to the rebels; soon after which they boldly marched to meet the royal army. The engagement took place on the 9th of March 1611, and was fought with great obstinacy on both sides: the advantage even appeared for some time on that of the rebels; till Emana Christos, perceiving that all was at stake, pushed desperately forward to the place where Melchizedec himself was. The latter seeing no probability of avoiding a single combat, which he did not choose to try, instantly turned his horse and fled; and the rest of the army soon followed his example. Melchizedec,

Ethiopia.

203 An army of Galla cut off.

204 Coronation of the king.

205 The impostor Jacob assassinated.

206 Dangerous rebellion begun by Melchizedec.

207 Defeats one of the king's generals.

208 Causes Arzo to be proclaimed king.

Ethiopia however, did not much avail himself of this cowardice; for he was closely pursued by the peasants, taken prisoner, and executed as a traitor, together with several of his principal officers. The fate of Prince Arzo, whom, to support their cause, the rebels had proclaimed king, is not known.

209
Is defeated,
taken pri-
soner, and
put to
death.

210
The rebel-
lion conti-
nues.

211
Cruel man-
ner of car-
rying on
the war.

212
Amdo, an-
other im-
postor, sup-
ported by
the Jews.

213
War with
Gideon.

214
Amdo de-
livered up
and put to
death.

This victory, so far from extinguishing the spirit of rebellion, seemed to have inflamed it beyond all bounds: for news were now received that the whole country round the head of the Nile to the province of Tigré had revolted; so that there was a necessity for the immediate presence of the emperor himself; and even this was insufficient, as the rebels were dispersed over such a large tract of territory. His two brothers, Emana and Sela Christos, were therefore both employed against different rebel chiefs, while the king marched against those who were most formidable. The

principle on which this war was carried on seems to have been very cruel, viz. that of killing all the men, and carrying off the women and children for slaves. This was punctually executed, first upon the inhabitants of a mountainous district named *Gusman* on the Nile; though, at the intercession of the missionary Peter Pacz, the women and children, instead of being sold for slaves, were given to the Jesuits to be educated in the Catholic religion. The Gongas and Agows were next attacked with equal success, and still greater cruelty; one of their tribes, named *Zalabassa*, being almost entirely exterminated; but this, instead of having any good effect, seemed to multiply the rebels still more. The Agows and Galla invaded the provinces in the neighbourhood; and another impostor, whose true name was *Amdo*, but who pretended to be the unfortunate emperor Jacob, appeared as a competitor for the crown. This last rebel proved much more formidable than any of the rest. He was indeed surprised before he had time to collect any forces; but Gideon, king of the Jews of Samen, having killed the guards who watched him, set the impostor at liberty, and supported his cause. Thus he soon collected a very formidable army, with which he defeated and killed an officer named *Abram*, who opposed him with a considerable force. This brought Socinios himself against him, who instantly attacked the Jewish monarch Gideon, as being the principal support of his cause. As the country of the Jews was naturally strong, and very full of fortified places, the reduction of it was evidently a very difficult task. The first place attacked was a fortress named *Massiraba*; which, though very strongly fortified and garrisoned, was soon taken by storm, and every one in it put to the sword without distinction. Hotchi and Amba Za Hancasse, two other strong fortresses, shared the same fate. A fourth, named *Sengannat*, no less strong than any of the former, was also taken; Gideon himself narrowly escaping with his life in the attack. Discouraged therefore by so many misfortunes, and apprehending the total ruin of his country, this prince at last was content to sue for peace; which was granted on condition that Amdo should be delivered up. This traitor was condemned to a punishment very unusual among Christians, viz. that of being crucified; but in nailing him to the cross, his cries and groans so much affected the king, that he ordered him to be taken down and beheaded.

The war was now resumed against the Gongas and

Guba; whom the king annually invaded for the purpose of making slaves. In this expedition his officers not only executed their commission against these savages, but likewise carried off a great number of cattle from the Agows, who were then at peace with the emperor. This conduct was highly resented by Socinios, who obliged them to make restitution of what they had taken away; and the doing them justice in this particular, had more effect in reducing the rest of these people to obedience, than all the cruelties which had been committed since the beginning of the war.

In 1616, the emperor set out on an expedition against the Galla; but this was laid aside on the death of his eldest son, for whom he entertained a great affection. It was succeeded by a very cruel order against the Jews, whom Socinios now determined to exterminate without any apparent occasion. His commands, however, were executed with the utmost punctuality, so that very few escaped; and among the rest perished their prince Gideon lately mentioned. He was supposed to be immensely rich, and to have concealed his riches, which have been sought for in vain by the Abyssinians from that time to the present. The children of the murdered Jews were sold for slaves; and such of the profession as were scattered through the empire, had orders to renounce their religion and be baptized, under pain of death. Thus almost the whole Jewish religion was extinguished at once, as most of them chose rather to embrace Christianity than suffer death. In token of the sincerity of their conversion, they were all ordered to plow and harrow on the sabbath day.

This butchery being over, the expedition against the Galla was resumed, and carried on with the usual cruelty; while the Galla never once appeared to prevent the desolation of their country. Next year, however, a new association was made among these savages, and the empire invaded by them in two different parts at once. One of their armies was cut off to a man before they had time to begin their ravages; while the other fled on the first approach of the royal army, leaving their wives, children, and baggage, to the mercy of the enemy. Thus the king was left for a short time at rest from rebellions or foreign invasions; and this interval he determined to make use of in making war on his neighbour the king of Sennaar, from whom he had formerly received an affront. In this expedition he was assisted by one Wed Ageeb, a prince of the Arabs, who lived on the frontiers of Abyssinia. The allies proceeded with their usual cruelty, killing all the men, and selling the women and children for slaves. Vast numbers of cattle were carried off; and the victorious armies returned with an immense booty. The next expedition was against Fatima queen of the Shepherds, otherwise called *queen of the Greeks*, who resided on the north-east of Atbara. In this also the king proved successful, though less blood was shed than usual: but it was not long before this extraordinary success met with a severe check by the entire loss of an Abyssinian army; the favourite son of the emperor himself being killed in the engagement, with some of the best officers in the empire.

All this time Peter Pacz had applied himself with the utmost assiduity to the conversion of the Abyssinians to the Catholic faith; and in this undertaking he

Ethiopia.
215
Other mili-
tary expe-
ditions.

216
The Jews
extermina-
ted.

217
Successful
expedition
against the
Galla.

218
War with
Sennaar,
&c.

219
Progress of
the Romish
religion.

²²⁰
Excellent
character of
Peter Paetz. Ethiopia. he had been attended with wonderful success. He was indeed of all others the most fit for an undertaking of this kind among a rude and barbarous people. Besides an uncommon share of learning, he possessed an eminent degree of skill in the mechanical arts; by which he was enabled to teach the Abyssinians how to build houses of stone and lime, which they had never known before. In these he was at first mason, carpenter, smith, and architect, himself; and thus, to the astonishment of the whole empire, he built some churches and a palace for the king. His universal genius prepared the people for the reception of his opinions; while the barbarous ignorance and savage manners of his antagonists tended to prejudice every one against their tenets, though ever so just in themselves. Sela Christos, the king's brother, is said to have been converted by only reading the Abyssinian books with attention; in which, it seems, the ignorance of the priests had been displayed in an extraordinary manner. We have already seen how well the emperor himself was disposed towards the Romish church; and his example was followed by many of the principal people of the kingdom. At last the Abyssinian patriarch named *Simon* made a complaint, that irregularities in religion had been committed; and disputes held on matters of faith without calling him, or permission granted him, to support his clergy in these controversies. As Socinius had no opinion of this priest's learning or eloquence, he did not imagine that any harm could ensue to the cause from granting what he wanted. A public dispute was accordingly appointed; in which Simon's inferiority was so apparent, that Socinius now publicly declared his belief in the two natures of Christ.

²²¹
Letters
from the
pope and
king of
Spain. While the conversion was in this prosperous way, letters arrived from the pope and king of Spain, but without any promise of the temporal assistance, viz. the soldiers he had solicited; though they assured him of an ally far superior, the Holy Spirit himself, provided the emperor continued firm in his resolutions of embracing the Catholic faith. Socinius would probably have been as well satisfied with an account of a reinforcement of soldiers; but as matters stood, he was obliged to be content, and resolved to submit in form to the pope, renouncing for ever his connection with the Greek church. As it was improper, however, to send letters on a subject of such importance by a common messenger, proper persons were to be appointed who might occasionally assume the character of ambassadors, and act accordingly. This being resolved on, the next thing was to determine the way by which the ambassadors were to reach Europe. The usual track by Masuah was now shut up on account of the rebellion which existed in the neighbouring provinces; so that the more eligible way seemed to be through Narea and the provinces to the southward, by which they might reach Melinda, and from thence embark for Goa.

²²²
Determines
to submit to
the pope. The ambassadors were chosen by lot; which falling first on Antonio Fernandez, he named Fecur Egzie as his companion; and, all things being settled, these two set out for Gojam in the beginning of March 1613. It seems surprising that the Abyssinian monarch should have sent these ambassadors on such a dangerous expedition without a proper guard through

the barbarous countries they had to pass. This, however, seems undoubtedly to have been the case; as we hear of no other attendants they had than 10 Portuguese taken with him by Fecur Egzie, six of whom were to go no farther than Narea, but the other four were to proceed to India; forty men armed with shields and javelins were also granted, but this force was undoubtedly too small to answer any useful purpose. Sela Christos indeed furnished them with guides from the barbarous nations in the neighbourhood of Narea, taking hostages for the security of the travellers; but the insufficiency of these precautions soon appeared. Our ²²⁴ Account of travellers had proceeded but two days journey into the country of the Gongas, when they were treated in such an hostile manner, that one of the Portuguese was obliged to return with Fernandez to complain of the behaviour of the savages. On this information Sela Christos instantly dispatched three officers, with a proper number of troops to chastise them; by which means the ambassadors got safe to Mine, the name of some miserable villages on a ford of the Nile. Here they crossed the river on skins blown up, and next day entered the country of the Pagan Galla; and soon after, though not without great difficulty, they reached the kingdom of Narea the most southerly province of the Abyssinian empire, but quite surrounded by the Galla. Here they were received with great kindness by the commanding officer of the first fortified place they came to; but on being introduced to the king himself, they met with a very indifferent reception. This was owing to the insinuations of an Abyssinian monk, that they were to bring Portuguese soldiers that way into Abyssinia; which would be destructive to his kingdom. On calling a council, it was resolved to send them into the kingdom of Bali; so that they would be obliged to pass through a much more difficult and dangerous road than what was first intended. Having thus, as he supposed, provided against the danger which threatened his kingdom, he made them a present of 50 pieces of gold, recommending them at the same time to the ambassador from the sovereign of Gingiro, thro' which they were next to pass.

On leaving Narea, they received a convoy of 80 soldiers to conduct them safely to their next stage; after which they passed four days through countries totally laid waste by the Galla, and where they were obliged to hide themselves for fear of meeting with these savages. Proceeding still through woods and vast chains of mountains, they came to the river Zebee, or more properly *Kibbee*, from its white colour resembling melted butter, as the word imports. Fernandez describes this ²²⁵ river as larger than the Nile, and vastly more rapid. They passed it by a kind of bridge, but certainly a most tremendous one. The channel of the river is full of rocks; and betwixt every two of these a single tree was laid, so elastic that it would bend with the weight of one person; while the vast height of the precipice, and the sight of the roaring current below, was sufficient to strike the boldest with terror. At a small distance from this bridge was a ford, through which it was necessary that their mules should pass; which being accomplished without any accident, though with difficulty and danger, they entered the territory of Gingiro. Here they were hospitably received by the sovereign, and after a mutual exchange of presents proceeded to San- gara,

²²⁶ ^{Ethiopia.} gara, the capital of another small kingdom named *Gambat*, which was at this time governed by a Moor named *Amelmal*. During the time of their residence here, one Manquer, a schismatic Abyssinian, arrived, who insinuated to the king that the recommendations they had brought along with them were false. This reduced them to the necessity of staying there till messengers could be sent to Socinius to know whether it was so or not; which occasioned a delay of three months. At last orders were brought to send them off immediately. This favourable answer procured the dismissal of the ambassadors with presents; while the malicious Manquer was detained prisoner. He escaped, however, and overtook them in the next kingdom, named *Alaba*, which was governed by a Moor named *Aliko*. Here he accused them of a design to overturn the Mahometan religion altogether: which so exasperated the barbarian, that he threatened them all with death; and actually put them in prison, where some of the Portuguese died. At last, after holding a council in which Manquer gave his voice for putting them to death, it was resolved that they should be sent back to *Amelmal*; which was accordingly done, and from his dominions they returned to Abyssinia. Thus ended this memorable embassy, by which the Pope was deprived of any authentic documents which might show that any Abyssinian emperor had ever voluntarily submitted to him; and there can be no doubt that this miscarriage, more than any thing else, prevented the establishment of Popery in this country.

²²⁶ They are obliged to return.

²²⁷ A number of rebellions on account of religion.

²²⁸ The Abuna excommunicates the emperor, but is obliged to withdraw his sentence.

²²⁹ Attempts to assassinate the emperor.

Socinius had now gone so far in favour of the Catholic party, that he began to share in some measure the fate of Za Denghel, numberless conspiracies being formed against him; which it was undoubtedly owing only to the altered situation of affairs by the preaching and assiduity of Peter Paez, that he was able to withstand. The conspirators were at this time supported, not only by the Abuna, but by Emana Christos himself, the king's brother, whom we have frequently had occasion to mention. Their first step was the very same which had been so successfully taken by Za Selasse in the time of Za Denghel, viz. to pronounce sentence of excommunication on the emperor. He was at that time absent on an expedition against the Agows; but returned immediately on hearing what was transacted in his absence; informing the Abuna, that if he did not recal the excommunication without delay, his head should pay the forfeit. This spirited declaration had such an effect, that the Anathema was annulled, and the conspiracy dissolved for that time. It was next resolved between Emana Christos the king's brother, Julius his son-in-law, and Kessa Wahad master of the household, to assassinate the king in his palace. To accomplish this purpose it was concerted that they should desire an audience; that Julius should enter first, and present a petition of such a nature as would probably be refused: on this he was to begin an altercation; and during the continuance of it the other two assassins were to come up, and stab their sovereign before he had time to put himself in a posture of defence. Happily for Socinius, however, he was informed of his danger by a page just before Julius made his appearance: on which, instead of refusing the petition, he granted it immediately; so that there was no room for dispute. He then got up to walk; which was

scarce done when Emana Christos also came; on which Socinius invited them all to the terrace to walk with him. This prevented their falling upon him at that moment; and as they supposed they would have still a better opportunity on the terrace, they readily consented. But Socinius having opened a private door, at which he entered first, drew it quickly after him; and as this door had a spring lock made by Peter Paez, which shut it in the inside but could not be opened from without, the conspirators were disappointed. Being also sensible that their design had been discovered, they were obliged for some time to keep at a distance, but did not for that reason abandon their wicked projects. Their next scheme was to be put in execution when the king was absent on an expedition against Senaar, who had made a violent irruption into the Abyssinian territories. The object now was not the assassination of the emperor, but of his brother Sela Christos; because the emperor had taken the government of Gojam from Emana Christos, who was a schismatic, to give it to Sela Christos, who was a violent Catholic. The enterprise was begun by Julius; who issued a proclamation, that all those who believed two natures in Christ should leave the province of Tigré, where he was governor; and that such as were true friends to the Alexandrian faith should repair to his standard to fight for it. He then ordered the goods of all the Catholics in Tigré to be confiscated; and marched without delay into Gojam, in hopes to surprise Sela Christos. But here the whole scheme was baffled by the vigilance and activity of the emperor; for he having received information of what was going forward, returned into that province before the conspirators had received certain intelligence of his having left it. This so much damped the ardour of Emana Christos and Kessa Wahad, that they stood aloof without attempting any thing till Julius should try his fortune. That rebel was at first very much disconcerted; but soon recovering his courage, advanced to the place where the Nile issues out of the lake of Dembea, where he met with the Abuna. Being confirmed by that priest in his wicked designs, he resolved, by his advice, to fall upon the king before he could be joined by Sela Christos, Simon himself (the Abuna) offering to share his fortune; and to confirm all, a new and solemn excommunication was pronounced against the king and all his adherents. Socinius, alarmed at these proceedings, sent a message to Sela Christos, desiring him to come to his assistance as fast as possible. In the mean time he himself advanced to meet Julius; but chose his posts so judiciously, that he could not be forced to an engagement without great disadvantage on the part of the enemy. Notwithstanding this, Julius pitched his camp close to that of the king, with a design to force him to a battle at all events. This rash action was followed by one still worse. Simon had persuaded him, that as soon as the royal army should see him, they would abandon the standard of the emperor to join his. On this, without farther consideration, he rushed into the camp of Socinius with a very few attendants, and reached the emperor's tent. Here he was known by the guards, and instantly dispatched with all his followers; the whole army betaking themselves to flight after his death, and being pursued with great slaughter by the royalists. The plunder of the camp

^{Ethiopia.}

²³⁰ It miscarries.

²³¹ The rebellious spirit of the conspirators continues.

²³² Julius the emperor's son-in-law first appears in arms.

²³³ Is deserted by his associates.

²³⁴ Socinius excommunicated a second time.

²³⁵ His rashness and death.

Ethiopia

236
Emana
Christos
taken, but
pardoned.

camp was immense, Julius having brought all his riches, which he had amassed by a long course of extortion, into the field along with him; and all of these were distributed among the soldiers. A vast number of cattle were likewise taken, which Socinius distributed among the priests, judges, and lay-officers. By this complete victory the whole scheme of the conspirators was overthrown. Emana Christos having no forces capable of coping with his brother, and unwilling, as we have said, to assist Julius openly, had retired to a high mountain named *Melca Amba*, in the territory of Gojam. Here he was invested by Af Christos, an experienced general, whom Sela Christos had left governor when he joined the emperor. Emana, who was likewise an expert commander, would have made a vigorous defence; but unfortunately the mountain was so destitute of water, that in three days he was delivered up by his own men to save themselves from perishing with thirst. On being brought to the king, he was tried in a full assembly of judges, and condemned to death; but the king pardoned and sent him to Amhara.

237
Another re-
bellion by
Jonael.

This terrible conspiracy had been occasioned by the dispute concerning the two natures of our Saviour: another quickly followed on account of the dispute concerning the Sabbath-day; the Abyssinian church insisting on the observance of the seventh day of the week as a Sabbath, and the Romish church on the observance of the first day. The author of this rebellion was one Jonael, who had been concerned in the expedition formerly mentioned, in which the Agow's cattle were driven away, and afterwards restored by the king. It is more than probable that his resentment on this account contributed much to increase his zeal on the present occasion; but whatever was the real cause, religion was the sole pretence. He began with a most insolent but anonymous letter to the king; in which the arguments of the Alexandrians for the observance of the Jewish Sabbath were stated, and the contrary doctrine condemned with the utmost virulence of expression. The king himself was reviled in the most opprobrious manner, compared to another Dioclesian, the Jesuits said to be relations of Pontius Pilate, and all of them devoted to hell without redemption. By this stupid performance the king was so much offended, that he added a clause to the former proclamation, commanding that "all out-door work, such as plowing and sowing, should be publicly followed by the husbandman on the Saturday, under penalty of paying a web of cotton-cloth for the first omission, the value of the cloth to be 5 s.; the second offence to be punished by a confiscation of moveables, and the offence not to be pardoned for seven years." To this Socinius added a speech from the throne in vindication of himself, concerning the part he had taken in religious matters; and to show that he was in earnest, caused the tongue of a monk to be cut out for denying the two natures of Christ, and one of his generals to be whipt for observing the Jewish Sabbath.

In the mean time Jonael having collected what forces he could, openly declared against his sovereign; but not daring to meet him in the field, he retired into the country of the Galla, on hearing that Socinius was approaching him with an army. On this the king

entered their territories, and laid them waste; which created a dissention among the savages themselves; one party being for affording him protection, the other for delivering him up. This being made known to the king, he sent a few presents to the faithless barbarians of Jonael's party; who returned his kindness by sending him the head of the rebel, though but a short time before they had fought with their brethren for his rescue.

A more formidable enemy than Jonael, however, still remained. The province of Damot was one of the most disaffected to Socinius in the whole empire; and to this place the greatest part of the religious fanatics in other provinces had retired. They now mustered up an army of more than 12,000 men, among whom were 400 monks, all of them armed with shields, lances, and swords; inspired, besides, with such a degree of religious enthusiasm, that they expected to be rendered invulnerable by all terrestrial weapons, and that armies of angels would fight in their cause. Against these Sela Christos was dispatched with about 7000 excellent soldiers; and as the general himself was a zealous Roman Catholic as well as most of his men, we need not doubt that both parties imagined themselves sure of the protection of heaven, and consequently that the encounter would be very violent. The two armies met on the 16th of October 1620; but Sela Christos was unwilling to destroy the infatuated people, who he knew would be unable to resist his veteran troops. He therefore first showed them his superiority in some skirmishes; and then sent a pathetic message, offering a general pardon if they would lay down their arms. The messengers, however, were not allowed to approach, so that an engagement became unavoidable. The numbers of the rebels, as Sela Christos had foreseen, availed very little against the discipline of the veterans he commanded. The 400 monks made a most obstinate resistance; and did not yield till after 180 of them had been killed on the spot.

Socinius, having once more vanquished his enemies, now determined to show his attachment to the church of Rome more openly. Having therefore sent for Peter Paez, he told him his final resolution to embrace the Catholic religion in its full extent; after which he renounced the Alexandrian church in the most explicit manner. His renunciation was followed by a proclamation vindicating his conduct; in which, besides the arguments used for the Pope's supremacy, &c. he insisted much on the bad lives of the clergy of the opposite party, and for which it appeared that there was in reality too much foundation. This was the last work of the excellent missionary Peter Paez, who died of a fever immediately after his leaving the king. The example of the sovereign, however, had very little effect upon his subjects. The proclamation was followed by a new rebellion in Amhara. Unluckily the enemies of his brother Sela Christos had persuaded Socinius to deprive him of his government; and there was no other in the kingdom who could be entrusted with such an important commission; so that the king soon found himself under a necessity of replacing and committing to him the charge of the war against the rebels. In this he was attended with his usual success: for the rebel chief, finding himself unable to contend with his enemy, repaired for assistance to the Galla;

Ethiopia.

238
He is mur-
dered by
the Galla.239
Another
rebellion.240
Desperate
enthusiasm
of the
monks.241
The empe-
ror publicly
renounces
the Alex-
andrian
faith.242
A new re-
bellion
breaks out.

Ethiopia. Galla; who no sooner had him in their power than they killed him on the first offer of the imperial general, mangling his body in such a manner that scarce a bit of it remained to be sent to his antagonist.

243
The rebel
chief mur-
dered by
the Galla.

244
A new pa-
triarch and
missionaries
arrive in
Abyssinia.

245
Socinius
takes an
oath of
submis-
sion to
the pope.

246
Violent
conduct of
Sela Chri-
stos,

247
And of the
emperor
and patri-
arch.

In the mean time news of the revolution in religious matters which had taken place in Abyssinia, arrived in Europe. Though the embassy to the Pope and king of Spain could not pass, as has already been related, yet frequent accounts had been otherwise transmitted; which produced such an effect, that a new set of missionaries, with a patriarch (Alphonso Mendez) at their head, were sent to Abyssinia. They arrived at Gorgora, the seat of royal residence, in the beginning of the year 1626; and at the very first audience of the emperor, it was agreed that he should take an oath of submission to the Pope. The ceremony was performed with all the splendor that could be contrived: the patriarch then preached a sermon on the Pope's supremacy in the Portuguese language, intermixed with Latin quotations; which is reported to have greatly confirmed the faith of the emperor and his brother, though neither of them understood a word of the languages in which it was preached. An answer to this unintelligible discourse was made in the Amharic language, which was equally unintelligible to the patriarch and his attendants; and to this the patriarch added a few words of a reply equally ill understood. At the conclusion of the dispute, an oath of the Pope's supremacy was taken by the emperor himself on his knees, then by the princes, and afterwards by all present, according to their different stations. Sela Christos, not contented with taking the oath, drew his sword, and in words not easily understood, denounced vengeance on "those who fell from their duty;" and he likewise added to the oath of supremacy another to the emperor and Facilidas the Prince Royal; but if the latter should fail in the defence of the Catholic faith, he swore to be his greatest enemy: nor would he be satisfied without imposing this clause upon all the officers, whether civil or military, then present.

This violent conduct of Sela Christos procured him a number of enemies, and at last was the occasion of his destruction; but that of the king and patriarch set the whole empire in a flame. An excommunication was first pronounced upon all who did not keep the oath: a proclamation was next issued, that all priests should previously embrace the catholic religion under pain of death; and that every one, under the same penalty, should observe Lent and Easter according to the rules of the Romish church. The patriarch proceeded in the same style; re-ordaining the clergy, consecrating the churches over again, rebaptizing the people, even such as were full-grown, abrogating circumcision, polygamy, and divorce (for these had been allowed by the Alexandrian church), and reducing the moveable feasts entirely to the rules of the church of Rome.

Though polygamy and divorce are no doubt inconsistent with the pure doctrines of the gospel, yet it was very improper to meddle with these practices at once in such a violent manner. Besides the confusion that this would naturally occasion in private families, these practices gave occasion to many questions in law, which it belonged to the civil judges to decide; but now these were all subjected to the authority of the

N 120.

patriarch: and from some other steps taken by this prelate, it appeared that he intended to encroach much farther upon the civil authority. One of these related to the church-lands; which in Ethiopia are granted by the king, and resumed at his pleasure; others being granted in their place, so that neither priests nor monks have any property in them. On the present occasion, an Abyssinian nobleman had possessed some lands belonging to a catholic monk; for which he was called before the patriarch. On his refusing to submit to this new tribunal, he was instantly condemned to restore the lands; but refusing this also, the patriarch took an opportunity, as he was attending the emperor at church, to pronounce sentence of excommunication against him, giving him over at once, soul and body, to the devil.—On hearing this terrible sentence pronounced, the nobleman fainted away, and was with difficulty recovered. On the intercession of the emperor, however, the curse was taken off; but the incident produced a very disagreeable effect on the minds of the people, who from that day began to entertain a greater aversion than ever to the Roman Catholics and their priests. This aversion was greatly increased by the absurd conduct of the patriarch, in ordering the body of an Abyssinian saint to be taken up, and thrown out of the grave in an ignominious manner, because it had been buried under the altar of a church, which he imagined was thus defiled. In all other respects, the patriarch behaved in such an insolent and overbearing manner, that the effects of his oppression soon began to be universally felt, and the Catholic religion began very quickly to decline.—The first stroke given to it was the alteration of the liturgy; which was done at the desire of the emperor. Ever since the establishment of the Catholic religion, the Latin mass-book, &c. had been made use of according to the practice of the church of Rome; but as it seemed very unreasonable to impose this at once upon the Ethiopians, Socinius ordered the patriarch to make such alterations in the old Abyssinian liturgies as he thought proper, that the people might thus have an opportunity of paying their devotions in a language they understood. The patriarch, not being able to assign any solid reason to the contrary, was obliged to comply; but no sooner was this done than the people made use of their old liturgies entirely, without the least regard to the innovations of the patriarch. In the midst of the confusion which daily took place from these causes, the Galla made a dreadful invasion, and cut off one of the emperor's generals with his whole army: nor were all the abilities of Sela Christos, who had so often distinguished himself, sufficient to retrieve matters; so that the savages, after having ravaged the country for some time at pleasure, returned home loaded with booty. This misfortune was followed by the revolt of Tecla Georgis the king's son-in-law; who not only made religion the pretence for taking up arms, but insulted the Catholics in the most outrageous manner; collecting their images and other religious trinkets into an heap, and then publicly setting fire to them. After this he called before him his own chaplain, named *Abba Jacob*, who was a Catholic, stripped him of his pontificals, and killed him with his own hand. A reconciliation with Socinius was now impossible; so that he had no resource but in arms. In this,

Ethiopia.

248
An Abyssinian nobleman excommunicated.

249
Body of an Abyssinian saint thrown out of the grave.

250
Catholic liturgy altered.

251
An army cut off by the Galla.

252
Tecla Georgis, the king's son-in-law, revolts.

Ethiopia.
253
Is defeated,
taken, and
executed.

this, however, he was equally unsuccessful with the other rebels in this reign; being defeated, taken prisoner, and put to death along with his sister Abdera, notwithstanding the intercession of a Catholic missionary for him, and that of the queen and ladies of the court for his sister.

254
Revolt of
the Agows,
who set up
Melcha
Christos.

As the reasons given by the king for refusing such powerful intercession were purely religious, the people became more and more averse to a profession so extremely oppressive and sanguinary as that of Rome seemed to be. A revolt of the Agows quickly followed; not that religion had really any share in their determinations, but that they were exasperated by the slavery and oppression to which they saw themselves subjected. They now therefore set up Melcha Christos, a prince of the royal blood, as a pretender to the crown; and soon put on such a formidable appearance, that the king himself thought proper to march against them with an army of 30,000 fighting men, which with the servants and other attendants amounted to more than 80,000. Melcha Christos retired with his troops to the craggy mountains of the country; and being imprudently followed by the emperor, rolled down such quantities of stones from the precipices, that Socinios was obliged to retreat with great precipitation, after having lost almost one half of his army.

255
The rebels
defeated by
Sela Christos.

256
Læca Mariam's
revolt and
death.

On this defeat the emperor found himself obliged to apply to Sela Christos, whom he had again disgraced and deprived of his government. He succeeded in giving the rebels a dreadful overthrow, which for some time entirely broke their power; but this success was quickly followed by the revolt of Læca Mariam, a near relation of the king. He also was defeated, and obliged to retire to a mountain so steep, that though he ascended it in safety, he was dashed in pieces with many of his followers in attempting to descend; the rest, who escaped this danger, being killed by their pursuers. Still, however, the rebel Melcha Christos was unsubdued; against whom Prince Facilidas, the heir apparent to the throne, was sent, having under him a nobleman of most distinguished character named *Keba Christos*. The latter was defeated and killed, without its being in the power of Facilidas to do any thing towards the suppression of the rebellion. This misfortune was followed by the death of Fecur Egzie, formerly ambassador with Antonio Fernandes to the pope, but now lieutenant-general to Sela Christos. He was cut off with a small body of troops by the Galla; and from many misfortunes befalling the imperial troops, the power of Melcha Christos was augmented to such a degree, that he now began to act as a king, and appointed a deputy-governor to one of the provinces. His opinion of his own importance, however, had almost proved his ruin; for the new governor having appointed a great festival on a Saturday, in opposition to the royal edict, he was attacked by a party of the king's troops, and entirely routed with the loss of 4000 of his men. This defeat

258
A rebel general
entirely de-
feated.

259
Prince Facilidas de-
feated.

was revenged by an overthrow given to Prince Facilidas himself; the blame of which was laid upon Sela Christos. The latter, as we have often had occasion to observe, was not only a most valiant commander, but a rigid Catholic; and these two properties might naturally have been thought to secure him in favour with the emperor. His violent conduct in regard to

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the Catholic religion, however, had raised him so many enemies, that accusations were perpetually brought against him; and one disgrace constantly followed another, notwithstanding all his services. The present accusation was brought by one Lefana Christos, whom Sela Christos had formerly condemned to death. For this offence he had received a pardon from Socinios; and he now revenged himself upon his former judge by accusing him to his sovereign. Sela Christos was not unmindful of this conduct; and therefore, as soon as he had him in his power, put him to death without regarding the pardon he had received. The emperor on this deprived him of the government of Gojam, which he gave to Serca Christos, who was supposed to be a dependent on Prince Facilidas, and was besides cousin to the emperor himself. The new governor, on his entering upon office, promised solemnly to support the Catholic religion; but no sooner did he arrive in Gojam, than he solicited Prince Facilidas to rebel against his father, and re-establish the Alexandrian faith. This was not the only instance in which he showed his disobedience. He had received the charge of a caravan which came annually from Narea; but instead of acting properly in this respect, he employed himself in driving off the cattle of the Agows and Damots, who expected no harm, and were consequently quite unprepared. Such numbers of them were carried off on this occasion, that 100,000 are said to have been sent to the Abyssinian market. Socinios, when informed of such an atrocious robbery, ordered him to restore the cattle, and to surrender himself prisoner; but instead of complying with this order, he again solicited Facilidas to revolt against his father. For this he was sharply reprovèd; but now, determining to make the world believe that the prince had entered into his schemes, he sent a public message to him, in which he was desired to come and take possession of the kingdom. Facilidas imprisoned the person who brought this treasonable message, and soon after sent him to Socinios; but Serca Christos still persisted in his mad attempts. He now proposed to abolish the Romish religion throughout the kingdom; and with that view attacked a convent which Sela Christos had built in Gojam: but the fathers having been furnished with some fire-arms, made so good a defence, that he was obliged to give over the enterprize. He then took the last step to complete his folly, by openly revolting against the emperor, and setting up a prince of the blood-royal in opposition to him, whom he had found living in obscurity among his mother's relations. To cut off all possibility of reconciliation with the emperor, he renewed the sacrilegious practices of Georgis, and put to death a priest for refusing to deny the two natures of Christ. Thus he procured a multitude of enthusiasts to join him; but when the affair came to a decision, and Prince Facilidas with a well disciplined army was sent against him, it then became evident how little the fanaticism of a tumultuous rabble availed against the skill of a regular army. The rebels fought, however, with great obstinacy till most of them were killed, their commander being obliged to take refuge on a mountain; from whence being unable to make his escape, he at last came down and surrendered at discretion. We need not doubt of his fate; but notwithstanding the execution of this

Ethiopia.
260
Sela Christos un-
der-
fally hated.

261
Deprived
of the go-
vernment
of Gojam.

262
Revolt of
the new go-
vernor.

263
He is de-
feated, ta-
ken, and
put to
death.

Ethiopia. rebel, another still remained. This was Melca Christos, against whom the emperor next prepared to march. He now found, however, the bad consequences of having acted so violently in favour of the Catholic religion. His army was so disaffected, that he could scarcely put any confidence in them. For this reason he issued a proclamation, that such as chose to observe the Wednesday as a fast instead of Saturday, had liberty to do so. This and some other indulgencies being reported to the patriarch, the latter sharply reproved him as committing an encroachment on the priesthood; and put him in mind of the punishment of leprosy inflicted upon Uzziah for assuming the priest's office. Thus an altercation commenced; and it was evident, from the behaviour of Socinios, that his extreme favour for the Romish religion began to decline. After this he set out for the country of Lasta, where Melcha Christos was; and the entrance to which was guarded by very high and rugged mountains. Among these the rebels had strongly fortified themselves; but were driven from four posts by the king's troops, so that the latter imagined a complete victory had been gained. Assembling themselves, however, on the top of another high mountain, the rebels watched their opportunity; and descending suddenly upon them, cut off great numbers, and obliged the rest to make a precipitate retreat. Another campaign was therefore necessary; but now the army lost all patience. They were become weary of making war on their countrymen; and, after slaughtering them in the field, seeing the intervals between the campaigns filled up with numerous executions of those who had escaped the sword. A deputation was therefore sent from the soldiers by Prince Facilidas, who, though he had never declared his sentiments openly, was strongly suspected of being no friend to the Catholics. The purport of the deputation was, that they did not mean to say that the Romish profession was a bad one, but it was such as they could not understand; and consequently there could be no merit on their part in professing it. They were ready, however, to lay down their lives for the public good, provided their ancient religion was restored; but this was a point they would not give up, and without which they would neither concern themselves in the quarrel, nor even wish success to the emperor's arms. With regard to the Romish religion, they added this declaration, perhaps the strongest possible mark of aversion, that they did not wish to know any thing about it. Socinios, therefore, according to the Abyssinian accounts, promised to restore the Alexandrian faith, on condition that he returned victorious from Lasta. The army then readily agreed to follow him wherever he pleased; while the rebels, having left their fortresses in Lasta, probably from a confidence in their own strength, boldly marched towards the royal army. In the engagement, however, they did not show their usual alacrity, and were soon defeated with the loss of 8000 men. Many of their best officers were killed on the spot, and Melca Christos himself escaped only by the swiftness of his horse.

267
Melca
Christos de-
feated.

By this victory the power of the rebels was broken; but it was not attended with the same satisfaction to the people with which other victories were wont to be accompanied. On viewing the field of battle along

with Facilidas next day, the prince is said to have made a pathetic speech to his father; in which he told him, that the bodies of the men he saw dead on the field of battle were neither those of Pagans nor Mohammedans, but of his own Christian subjects; and that victories of this kind were like driving a sword into his own entrails. "How many men (says he) have you slaughtered? how many more have you yet to kill? We are become a proverb even to the Pagans and Moors for carrying on this war; and for apostatizing, as they say, from the faith of our ancestors." The king did not make any reply at that time; but the effects of the prince's words were soon apparent. The patriarch took the first opportunity of upbraiding him with his ingratitude to the Catholics, and deserting the religion whose professors had by their prayers obtained such a signal victory. To this Socinios replied in general, that he had done every thing in his power to establish the Catholic religion; for which he had shed the blood of thousands, and had still as much more to shed: but that he should consider of the matter, and acquaint him with his final resolution. This was by no means favourable; for next day, in a message to the patriarch, he recounted the many rebellions which had been excited on account of religion; and concluded with telling him, that though the faith of Rome was not a bad one, yet the people of Abyssinia did not understand it. For this reason he was determined to grant a toleration, by allowing such as professed the Catholic faith to do so in peace, and such as rather chose that of Alexandria to do the same. The patriarch replied, that he had no objection to grant this indulgence to such as had not yet embraced the Catholic faith; but those who had done so could not be permitted to renounce it without a grievous sin. Thus a new system of persecution would have commenced: but the emperor, understanding well the purport of his discourse, replied, that if this was the case, he was no longer master of his own kingdom; and immediately afterwards issued a proclamation, wherein he declared the Alexandrian faith restored, with the altars for the sacrament, liturgy, and every other thing belonging to it; at the same time, that being now old and infirm, he himself resigned the crown and empire to Facilidas.

This remarkable proclamation was made on the 14th of June 1632; after which Socinios took no farther care of publick affairs, nor did he long survive this transaction. He died on the 7th of September this year, and with him fell all the hopes of the Jesuits. Facilidas, as had been rightly conjectured, was an inveterate enemy to the Catholic faith. As soon therefore as he had obtained the government, even before he took upon himself the title of king, the Catholics were every where displaced from offices of trust and honour; but as soon as he found himself established on the throne, a letter was sent to the patriarch, informing him, that as the Alexandrian faith was now restored, it was become indispensably necessary for him to leave the kingdom, especially as the new Abuna was on the way, and only deferred his journey till the Romish priests should be out of the country. For this reason he commanded the patriarch, with all his brethren, to leave their convents throughout the empire, and retire to Fremona in the kingdom of Tigré, there to wait his further pleasure. The patriarch attempted to soft-

Ethiopia.
263
Pathetic
speech of
prince Fa-
cilidas to
his father
concerning
the war.
Bruce's
Travels, vol.
ii. 943. p.

269
An univer-
sal tolera-
tion grant-
ed.

270
Opposed by
the patri-
arch.

271
The empe-
ror restores
the Alex-
andrian
faith, and
reigns the
kingdom.

272
The new
emperor
an enemy
to the Ro-
mans.

273
The patri-
arch com-
manded to
quit Abyss-
inia.

Ethiopia

en him by many concessions, but in vain; on the 9th of March 1633 he was ordered, with the rest of the fathers, to proceed immediately for Fremona. This they were obliged to comply with; but the emperor, understanding that they were about to establish themselves, and to solicit succours from Spain to accomplish their purposes by force, he sent orders to the patriarch instantly to deliver up all the gun-powder they had at that place, and to prepare without delay to set out for Masuah. Still the insatuated and obstinate priest determined not to comply with the emperor's orders. At last he thought proper to deliver up the gun-powder; but resolved to leave his companions behind him, and to disperse them as much as possible through the empire, in case he himself should be obliged to embark at Masuah; which, however, he did not by any means intend. For this purpose he applied to the Baharnagash, named *John Akay*, then in rebellion against the emperor; who carried them all off from Fremona in the night-time, under a guard of soldiers, and lodged them safely in a strong fortress named *Adicotta*. Here the patriarch imagined that he might remain in safety till he should be able to procure succours from India. In this, however, he was deceived. John conveyed them from place to place, through many unwholesome situations, till their strength as well as their patience was exhausted. At last, on receiving a present of gold, he allowed them to return to their old habitation *Adicotta*. *Facilidas*, then, being determined at all events to get rid of such troublesome guests, endeavoured to prevail upon John by bribes to deliver them into his hands. John was too delicate to comply with this request, which he supposed would be a violation of hospitality; but he consented, on receiving a proper compensation, to sell them to the Turks. Two were left in Abyssinia, in hopes of soon sharing the crown of martyrdom; and this indeed *Facilidas* did not delay to put them in possession of, both being ordered for execution as soon as he got them into his power. Not content with this, and being perpetually apprehensive of fresh invasions from Europe, he entered into a treaty with the Turkish bashaws to keep the ports of Masuah and Suakem shut against them; by which their entrance into Abyssinia would be effectually prevented.

274
He applies for protection to the Baharnagash, then in rebellion.

275
The patriarch and other missionaries sold to the Turks.

276
Sela Christos put to death.

During these transactions, the emperor took the most effectual methods otherwise to eradicate the Romish religion, by cutting off the principal persons who professed it, or obliging them to renounce their profession. The principal of these was his uncle *Sela Christos*, who had deserved so well of the late emperor *Socinios*, and of the whole empire in general. His excessive bigotry in religious matters proved the cause of his destruction, as has formerly been hinted. When it was proposed to him to renounce his faith, he absolutely refused to do so, either to avoid the greatest punishment the king could inflict, or to obtain the greatest gift he had in his power to bestow. On this he was banished to an unwholesome district among the mountains of Samen; but as even here he kept up a correspondence with the Jesuits, and wished to facilitate the introduction of more Portuguese from India, he was sentenced to be hanged on a cedar-tree.

The expulsion of the present race of missionaries did not entirely discourage the Europeans from attempting

to introduce a fresh mission into Abyssinia. The obstinate, haughty, and rebellious spirit of the Jesuits was universally condemned, and looked upon to be the cause of the extreme aversion showed by the emperor and the whole empire against the doctrines they professed. It was therefore hoped, and not without some appearance of reason, that the point might still be gained, provided the mission were undertaken by others less violent and insidious in their behaviour. After the execution of those who remained in Abyssinia, six Capuchins, the reformed order of St Francis, were sent with protections from the Grand Signior to facilitate their passage into Abyssinia, where they hoped to revive the drooping or rather lost cause of the Catholic religion. Nothing, however, could be more unfortunate than the event of this undertaking. The Galla murdered two who attempted to enter Abyssinia by the way of Magadoxa. Two who arrived safely in the country, were stoned to death; while the remaining two, hearing at Masuah of the fate of their companions, returned home with an account of it. The bad success of these did not deter three others from making the same attempt a short time afterwards; but they having imprudently informed *Facilidas* of their intention, were murdered by the bashaw of Masuah, who had received orders from him to this purpose. So particular was the emperor with regard to the execution of this order, that he caused the bashaw to send him the skin of their faces and heads; that he might know by their faces that they were Europeans, and by their shaved heads that they were priests.

Though the Catholic faith was now totally suppressed, the spirit of rebellion still continued; and *Melca Christos* continued as much in opposition to his sovereign as when he first took up arms on pretence of religion. At first he met with extraordinary success; totally defeated the royal army, though commanded by *Facilidas* in person; after which, pursuing his good fortune, he made himself master of the capital, entered the palace, and was formally crowned king. This, however, was the last of his good fortune. *Facilidas* having recruited his army as fast as possible, sent three able generals to attack his rival, who was now acting the sovereign in his palace. The rebels were surrounded before they expected any enemy, and almost entirely cut off, *Melca Christos* himself being killed in the engagement.

The victory over *Melca Christos* was followed by several successful expeditions against the Agows and Galla; but in the 6th year of the reign of this emperor, the rebels of *Lasta*, who seemed determined not to yield while there remained a possibility of resistance, chose the son of *Melca Christos* for their king, and again began their depredations on the neighbouring provinces. *Facilidas* marched against them with his usual activity; but had the misfortune to lose the greatest part of his army by cold among the mountains of *Lasta*, though it was then the time of the equinox, and consequently the sun was only 12° from being vertical, the latitude of *Lasta* being no more than 12°, and the sun 12 hours in the day above the horizon. Before this rebellion could be suppressed, another was begun, at the head of which was *Claudius* the king's brother. He had not the same good fortune with the rebels of *Lasta*; but was quickly defeated, taken prisoner,

Ethiopia.

277
A new mission undertaken by six Franciscan Capuchins.

278
Four of them murdered, and the other two returned.

279
Three others murdered by order of *Facilidas*.

280
Melca Christos still continues in rebellion.

281
Is defeated and killed.

282
The rebels choose his son for their leader.

283
The emperor's army perishes with cold.

Ethiopia. soner, and banished to a mountain called *Wechne*; which served from that time for the imprisonment of the princes of the blood-royal. The suppression of one rebellion, however, seemed to have no other effect than that of giving rise to another. A new expedition was to be undertaken against the Agows and Shangalla; but they had posted themselves so advantageously, that the royal army was entirely defeated without being able to make any impression on their enemies. Facildas, however, knowing that this defeat could be attended with no other bad consequence than the loss of the men, which had already happened, marched directly against the rebels of Lasta without attempting to revenge the defeat he had sustained. The rebel general, weary of contention, in which he probably saw that he would be finally unsuccessful, chose to submit unconditionally to the emperor; who, though he at first affected to treat him with severity, soon after released him from prison, bestowing upon him large possessions in Begemder, with his daughter Theoclea in marriage.

284
Princes of the blood again imprisoned on a mountain.

285
Facildas defeated by the Agows and Shangalla.

286
The rebels of Lasta submit.

287
Reign of Hannes.

288
Reign of Yafous.

289
His generosity to the banished princes.

Facildas died in the month of October 1665, and was succeeded by his son Hannes. This prince was such an enthusiast for Christianity, that in the very beginning of his reign he issued a proclamation forbidding the Mahometans to eat any flesh but what was killed by Christians; but so far was he from any inclination to favour the Catholics, that he ordered all their books which could be found in the empire, to be collected in a heap and burnt. Much of his time was spent in regulations of church-matters, and in contentions and trifling disputes with the clergy; which conduct so disgusted his son Yafous, that he fled twice from the capital, but was pursued and brought back. The last time was in the year 1680, when he found his father ill of the distemper of which he died. Hannes expired on the 19th of July that year, having lived at peace during the whole of his reign, excepting some trifling expeditions against the Shangalla and rebels of Lasta.

Yafous, who succeeded to the throne with the approbation of the whole kingdom, was of a very different disposition from his father; being generous, active, and brave to a great degree; he was also much less bigoted, and differed from him considerably in religious principles. Having settled church-matters as he thought proper, his next step, and the most glorious action of his whole reign, was to pay a visit to those of the royal family who were confined on the mountain of Wachne. He found them in the most miserable condition; all in tatters, and many almost naked; their revenue having been ill-paid by his father, who was of a sordid disposition, and the little they received having been embezzled by their keepers. Yafous being greatly moved at this spectacle, ordered a large sum of money to be divided among them for their present necessities, clothed them according to their rank, and settled matters so that no part of their revenue could ever afterwards be applied to improper purposes. To the governor of the mountain he assigned a large tract of territory, to make amends for the profit he had been accustomed to derive from the revenue of the princes; and finally, he left all the prisoners at the foot of the mountain, at perfect liberty either to take up their residence again on it or any where else. By these extraordinary instances of royal munificence the emperor so effectually gained the af-

fection of his relations, that they unanimously determined to return to their former state of confinement; and during the whole time of his reign no competitor for the crown ever made his appearance from among those who resided there.

Though Yafous is said to have possessed all the qualities which constitute a great and good monarch, the natural turbulence of his subjects, and the pestilent disposition of the monks, soon began to show themselves by new seditions. These were preceded by a violent irruption of the Galla, who were overthrown, as usual, with great slaughter; but soon after, being solicited by some monks who had drawn over a party of the Agows to their side, the disturbances were renewed. A grandson of Socinios, who had fled to the Galla when Facildas first banished the princes to Wechne, was proclaimed king. A multitude of savages immediately flocked to his standard, so that he was soon at the head of a very formidable army, while the Agows and other malcontents were ready to join him as soon as he should repass the Nile. The king, however, entirely disconcerted the scheme by his activity; for, advancing with the utmost celerity, he reached the banks of the Nile before the Galla on the other side were ready to join their allies on this side of it. The Agows were so confounded at his presence, that they allowed him to pass the river unmolested. The Galla were equally surprised at seeing the war transferred into their own country; and, with their usual fickleness, deserted the prince whose cause they had pretended to espouse. A few remained faithful, but were utterly defeated by the forces of Yafous; the unhappy prince himself, whose name was *Isaac*, being taken prisoner, and put to death in the presence of his rival. After this many great exploits were performed against the rebellious Agows, Galla, and other savages: but which, as they produced no other consequence than that of establishing the emperor's character for valour and skill in military affairs, we shall here pass over; only remarking, that, in the opinion of his subjects, one of his campaigns was the most glorious ever recorded in the annals of Abyssinia. The most memorable events in the present reign regarded religion, and a renewal of the correspondence betwixt Europe and Abyssinia; of which we have a particular account from Mr Bruce to the following purpose. About the end of the 17th century a number of Franciscans from Italy settled at Cairo in Egypt, and were maintained at the expence of the fathers in Palestine, though pretending to be independent of their superior the guardian of Jerusalem. The latter, displeased at this method of proceeding, offered to supply the mission to Egypt entirely at the expence of Palestine, and likewise to furnish from thence missionaries capable of instructing the people in the Christian religion. This offer meeting with a favourable reception at Rome, a new set of missionaries from Jerusalem, called by our author *Capuchins*, appeared at Cairo; from whence the Franciscans were banished, only two of them being allowed to remain in that city. The others returned to Rome; where, finding that they could not re-establish themselves by fair means, they had recourse to artifice and fiction. It was now pretended, that, on the expulsion of the Jesuits from Abyssinia, a great number of Catholic Christians had fled into the neighbouring

Ethiopia.

290

Irruption

of the Gal-

la, seditions

of the

monks, re-

bellion, &c.

291

Quelled

by the em-

peror.

292

Attempts

to revive

the religi-

ous missions

from Eu-

rope.

Ethiopia. bouring countries of Nubia and Sennaar, where they found themselves so grievously oppressed by the Mahometans, that, without some spiritual assistance, they would be under the necessity of renouncing their religion. This story being confirmed by the two Franciscans who remained at Cairo, the cause of these supposed Christians was eagerly espoused by the religious in Italy, and a new mission set on foot at the expence of the pope for their relief, which continues to this day under the title of the *Ethiopic mission*. The missionaries had it also in charge to penetrate if possible into Abyssinia; and to keep up, as far as was in their power, the Catholic faith, until a better opportunity should offer of making an attempt to convert the whole empire. For this purpose a convent was procured for them at Achmim in Upper Egypt; and permission was granted, notwithstanding their former banishment, to settle two of their order at Cairo independent of the fathers of Palestine.

While these transactions passed in Italy and Egypt, Louis XIV. of France was in the height of his glory. He had attempted to rival the ancient Greeks and Romans in the magnificence of his works; but his conduct with regard to religion, his persecution of the Protestants, and revocation of the edict of Nantz, had stigmatized him throughout the greatest part of Europe as a bloody and merciless tyrant. To wipe off this stain, the Jesuits, his great spiritual directors, formed a scheme of inducing the emperor of Abyssinia to send an embassy to France; after which they hoped that they might get themselves replaced in the *Ethiopic mission*, to the exclusion of the Franciscans. The king, whose pride was very much flattered by the proposal, readily came into it; but the Pope's consent was still necessary. His Holiness was by no means pleased with this intrusion of a temporal prince into spiritual affairs: nevertheless, he did not choose to enter into any contest; but that he might undo with one hand what he did with the other, he appointed six Jesuits, of whom Verseau, the ambassador of Louis to himself, was one, to be missionaries to Abyssinia, but the superior of the Franciscans to be his legate *à latere* at that court; providing him with suitable presents for the emperor and principal nobility.

The Jesuits now finding themselves in danger of being supplanted by the Franciscans, applied to the Pope to know which of the two orders should make the first attempt to enter Abyssinia; but received no other answer than that those who were most expert should do so. Verseau, probably displeased at this conduct of the Pope, went to a convent in Syria of which he was superior, without making any attempt to enter Ethiopia: therefore the mission remained in the hands of two persons of opposite professions, a Jesuit and Franciscan; the name of the latter being *Paschal*, an Italian; and of the former *Brevedent*, a Frenchman. The latter was accounted a man of learning and probity, zealous in the cause of his religion, but by no means imprudent or rash in his attempts to promote it.

²⁹³ In the mean time an unforeseen accident procured admittance to the missionaries into Abyssinia more readily than could have been expected in the present situation of affairs. Yafous and his son had both been attacked by a scorbutic disorder which threatened to

turn to a leprosy; on which one Hagi Ali, a Mahometan factor at Cairo, received orders to bring with him an European physician on his return to Abyssinia. It happened that this man had formerly been acquainted with Friar Paschal, who had administered some medicines to him. He now proposed that Paschal should accompany him to Abyssinia in the character of a physician; and that Friar Anthony, another of his own order, should go with him as his companion. But this scheme was frustrated by Maillet the French consul, who had the charge of the whole from Louis XIV. and wished that the Jesuits alone should have the conduct of the mission. For this purpose he represented to Hagi Ali, that friar Paschal understood nothing of medicine; but he promised to furnish him with another, whose skill he extolled above all those of ancient or modern times. Hagi Ali, who knew nothing of the matter, readily agreed to Maillet's proposal; and Charles Poncet a Frenchman, who had been bred a chemist and apothecary, was appointed to the office of physician, with Father Brevedent to attend him as his servant. Thus the scheme of the Franciscans was for the present overthrown: but unluckily Maillet employed one Ibrahim Hanna, a Syrian, to write letters to the Abyssinian monarch and some of his principal nobility, which he desired him to submit to the inspection of one Francis a capuchin or monk of the Holy Land, and consequently an enemy to the Franciscans. Ibrahim, not being acquainted with the monk he mentioned, and thinking any other would answer as well, carried the letters to one of the same name, but of the Franciscan order. Thus the whole secret was divulged at once; and the Franciscans, with the malevolence essential to such religious miscreants, resolved on the destruction of Poncet and his attendants. At present, however, their sanguinary intentions were defeated; Poncet set out immediately after he had received his commission, and arrived safe at Gondar the capital of Abyssinia, with his attendant Father Brevedent, on the 21st of July 1699. Brevedent died on the 9th of August; but Poncet lived to execute his commission, by making a full cure of his royal patient. On the 2d of May 1700, he set out on his return for Europe, and arrived at Masuah without any bad accident.

It has already been observed, that the main end of this undertaking was to procure an embassy from Abyssinia to the French monarch; and this end also was gained. An ambassador was procured, but unluckily not such a one as M. Maillet the chief manager of the whole project desired. This man, intoxicated with absurd notions of nobility and distinctions of rank, could not make allowance for the difference between the appearance of an ambassador from a barbarous monarch, however powerful, and one from the sovereign of a civilized and polite nation. The ambassador sent by Yafous, therefore, having been originally no other than a cook, could not be agreeable to a man of such a disposition. The presents sent by the Abyssinian monarch indeed, had they arrived, would have probably conciliated matters. These were, an elephant, some Abyssinian young women, &c. but unluckily the elephant died, and the ambassador was robbed of all the rest by a Turkish bashaw. Maillet, therefore, naturally proud, imperious, and covetous, thought pro-

Ethiopia.

²⁹⁴ Friar Paschal and another Franciscan undertake the office.

²⁹⁵ Disappointed by M. Maillet.

²⁹⁶ Poncet and Brevedent appointed.

²⁹⁷ The Franciscans resolve the destruction of the missionaries.

²⁹⁸ Poncet sets out on his return after curing Yafous.

²⁹⁹ The Abyssinian ambassador disagreeable to M. Maillet.

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³⁰⁰
Ethiopia
He is not
allowed to
proceed to
France.

per to call in question the authenticity of Morat the ambassador's mission, to call Poncet himself a liar, and not to allow the former to proceed to France. The transactions on this occasion are set forth at length by Mr Bruce, greatly to the disgrace of Maillet; but as details of this kind would swell the present article beyond due bounds, we must refer the curious reader to the work just mentioned.

³⁰¹
M. de Roule
sent am-
bassador
from
France.

Thus the scheme of procuring an embassy from Abyssinia having proved abortive, the next project of the Jesuits was to get an embassy sent from France, whose object was to be the cementing a perpetual peace betwixt the two nations, and to establish a lasting and commercial intercourse; though, whatever friendship or good-will might take place, it was evident that there was not a single article that could be exchanged between them, nor was there any ready communication betwixt the two countries either by sea or land. The person pitched upon as ambassador was M. de Roule, vice-consul at Damietta. He is characterised by Mr Bruce as "a young man of some merit, who had a considerable degree of ambition, and a moderate skill of the common languages spoken in the east; but absolutely ignorant of that of the country to which he was going, and, what was worse, of the customs and prejudices of the nations through which he was to pass. Like most of his countrymen, he had a violent predilection for the dress, carriage, and manners of France, and a hearty contempt for those of all other nations: this he had not address enough to disguise; and this endangered his life." Besides these disadvantages, he had the misfortune to be under the displeasure of all those of his own nation who resided at Cairo: so that the merchants were very much averse to his embassy; and, as the Franciscans and Capuchins were his mortal enemies, he had not a single friend in the world except Maillet and the Jesuits. Unluckily the consul missed him in one of the most material articles, and which was undoubtedly of the utmost consequence to him in the accomplishment of his purpose, viz. the presents necessary to be taken with him for the barbarous people through whose country he was to pass. Brocades, faddings, and trinkets of various kinds, according to Mr Bruce, were the proper wares; but, instead of this, he had taken along with him mirrors of various kinds, with the pictures of the king and queen of France, wearing crowns upon their heads. The former of these subjected him to the imputation of being a magician; while the latter, if shown to a Mahometan, would bring upon him the charge of idolatry. The worst misfortune of all was the malice and treachery of the Franciscans, who had already prejudiced against him the people of the caravan with whom he was to go, the governors of the provinces through which his road lay, and the brutal and barbarous inhabitants of Sennaar, who lie in the way betwixt Egypt and Abyssinia. The consequence of all this was, that he was murdered at the last mentioned place with all his retinue. The Franciscan friars, who had preceded him to Sennaar, left it before his arrival, and returned immediately after. There cannot therefore be the least doubt that they were the authors of his murder; though the bigotted disposition of Louis XIV. prevented all enquiry into the matter; so that the parti-

³⁰²
He is mur-
dered.

cular steps they took to accomplish their designs were never published to the world. Ethiopia.

The assassination of de Roule was preceded by that of Yafous emperor of Abyssinia, who fell by a conspiracy of his wife and son, occasioned by a fit of jealousy in the former. He was succeeded by his son Tecla Haimanout, who had conspired against him. Before his death, he had dispatched a message to the king of Sennaar, requiring him to afford M. de Roule protection at his court, and a safe conduct from it; but when the messenger was within three days journey of the capital of that kingdom, he received news of the assassination of Yafous. On this he returned in great haste to Gondar, in order to have the letters of protection renewed by Tecla Haimanout the reigning prince. This was readily done: but before the messenger could reach Sennaar, he was informed that de Roule was already assassinated; on which he returned with still greater haste than before. The Abyssinian monarch, provoked at such a scandalous violation of the law of nations, declared his intention of commencing hostilities against the king of Sennaar; and for this purpose assembled his army. But this was scarce done, before he was informed that a rival, named Am-da Sion, had been set up against him by the friends of his father Yafous, and had been for some time privately collecting troops to surprise him before he could be ready to make any opposition. It was therefore necessary to employ the army destined against Sennaar to reduce this rebel to obedience; and scarce was this done, when the emperor himself was assassinated; so that all thoughts of revenging the death of M. Roule were laid aside. The new emperor in- tends to re-venge his death;

³⁰³
Tecla Haimanout perished in 1706, and was succeeded by his uncle Tiffilis, or Theophilus; whose first care was to apprehend all those suspected to have been concerned in the death of his predecessor. Thus the murderers of Yafous, whom Tecla Haimanout had instigated, imagined themselves secure, and came to court without any fear of danger: but no sooner did Theophilus get them into his power, than he caused them all to be put to death without exception; the queen herself being publicly hanged on a tree. Not satisfied with avenging the death of Yafous by the execution of his murderers, he did the same with those of Tecla Haimanout; putting to death all who were immediately in his own power, and commanding the governors of the provinces to do the same with those whom they could find within their jurisdiction. One of these named Tigi, who had been formerly betwixt-det, having escaped into the country of the Galla, raised a very considerable army, with which he invaded Abyssinia, where he committed the most dreadful cruelties. Theophilus engaged him on the 28th of March 1709; when, with a force greatly inferior, he gained a complete victory. A number of the Galla fled to a church, hoping to be protected by the sanctity of the place; but the emperor telling his soldiers that it was defiled by those who were in it, commanded it to be set on fire, so that every one perished. Tigi, with his two sons, were taken prisoners, and put to death. The king himself did not long survive his victory; falling sick of a fever, of which he died in September 1709. After

³⁰⁴
The new
emperor in-
tends to re-
venge his
death;

³⁰⁵
But is him-
self mur-
dered.

³⁰⁶
Reign of
Theophi-
lus.

³⁰⁷
Execution
of the
queen and
other regi-
cides.

³⁰⁸
Tigi revolts
but is de-
feated, ta-
ken and put
to death.

Ethiopia.

309
Line of Solomon set aside.

After the death of Theophilus, the line of Solomon by the queen of Sheba was superseded a second time, and a stranger of the name of *Oustas* seated on the Abyssinian throne. The extreme severity of Theophilus in punishing the murderers of both *Yasous* and *Tecla Haimanout* gave occasion to this; for as both princes had been assassinated in consequence of conspiracies formed by the principal people of the nation, the number of conspirators was so great, that the parties concerned had interest sufficient to influence the election of the new monarch even in this most capital respect, of his not being a descendant of Solomon. Excepting this single defect, he was in every respect worthy of the kingdom, and was already the highest subject in it. Scarce was he seated on the throne, however, when a dangerous conspiracy was formed against him by the very persons by whom he had been placed upon it. *Oustas* baffled their designs, by seizing the principal conspirators before they had time to bring their schemes to a bearing; and several people of the first rank were condemned to lose their noses, or to be put to death. After this the emperor undertook an expedition against the *Shangalla*, according to the barbarous custom of the Abyssinian monarchs, who hunt these poor people merely for the sake of making slaves; slaughtering the men without mercy as well as many of the women, and carrying off only the boys and girls into captivity. In this he met with perfect success; and was about to attempt the conquest of the whole country, when he was called back by the news that his prime minister *Tafa Christos* was dead. While the emperor remained in his capital at *Gondar*, he was taken suddenly ill; which he at first imputed to witchcraft, and therefore used some antidotes; among which the smoking of the palace with gun-powder was one. But this was done so carelessly by the servants, that the whole building was consumed; an accident looked upon by the people in general as a very bad omen, especially as the king's complaint increased every day. At last the principal officers came to pay him a visit of condolence, as they pretended; but in reality to observe the nature of his distemper, and to consult whether or not it was likely to continue till they could fall upon means to deprive him of the government. *Oustas* understood their intentions, and therefore summoned all his strength to put on for a moment the appearance of health; so that the officers found him attending business as usual. Being thus disconcerted, it became necessary to make some apology for a visit so extraordinary and formal; for which they were at first somewhat at a loss: on recollection, however, they told him, that, hearing he had been sick, which they happily found was not the case, they had come to make a proposal concerning the succession; professing a desire that he would quiet the minds of his own family, and of the people in general, by appointing his son *Fasil* successor to the throne after his decease. *Oustas* gave them an equivocal answer; but the discourse concerning *Fasil* happening to be overheard by the soldiers, a violent mutiny ensued, and all the officers who had come to visit *Oustas* were killed. Part of the town was set on fire in the confusion; and at last a proclamation was made, that *David* son of *Yasous* was king of Abyssinia. The prince was then sent for from the mountain, and arriving at *Gondar* was crowned on the 30th of January 1714. The

310
The emperor falls sick.311
Oustas deposed, and *David* proclaimed emperor.

distemper of *Oustas* in the mean time continuing to increase, he died on the 10th of February the same year.

The new emperor was a rigid Alexandrian in principle; but *Oustas* had been so far favourable to the Catholics, as to entertain some of their priests, though in a private manner. As it was the custom, however, to call a convocation of the clergy on the accession of every new emperor, the monks and others insisted upon one being called on the present occasion; the more especially that a new abuna was come from Egypt, and the lenity shown to the Catholics by *Oustas* had excited the jealousy of the Abyssinian clergy in the highest degree. This assembly proved fatal to three Romish priests, whom *Oustas* had protected and supported for some time. They were brought before the king and Abyssinian clergy; who shortly asked them, whether they believed that the council of Chalcedon was to be accepted as a rule of faith, and that Pope *Leo* lawfully presided in it? To both these questions they answered in the affirmative: on which, without more trial, they were condemned to be stoned; and the sentence was instantly put in execution by the furious and ignorant multitude, only one person in the whole assembly exclaiming against it as unjust. The priests being thus gratified in one instance, insisted that *Abba Gregorius*, who had acted as an interpreter to the three just mentioned, should also be put to death; but this was prevented by *David*, who found, upon inquiry, that he had only done so in obedience to the express commands of *Oustas* his sovereign.

Here we must take notice, that though the faith of Abyssinia is always said to be the same with that of Alexandria, it is not for that reason to be imagined that the clergy are all of the same mind. On the contrary, many different parties exist among them, who hate one another no less than all of them do the church of Rome. The principal of these in the time we speak of were the monks of *Debra Libanos* and those of *St Eustathius*, to which last the emperor himself belonged. On the arrival of a new abuna, it is customary to interrogate him before the emperor and assembly of the clergy, which of the two opinions he adheres to. The emperor at present, not thinking his presence necessary, sent the betwixt with the principal persons of both parties to hear the profession of the new abuna, which was afterwards to be proclaimed to the people. The latter, probably not willing to contend with either party, gave an equivocal answer. But with this the king himself was dissatisfied; and therefore, without consulting the abuna farther, he caused it to be proclaimed, that the new abuna's profession was the same with that of the monks of *St Eustathius*. This was highly resented by the monks of *Debra Libanos*, who instantly ran to the abuna, and from him received a profession directly contrary to what had been proclaimed by the king's order. Not satisfied with this, they continued their tumult, disregarding the imminent danger they were in of falling under the king's displeasure. One of their number was so infatuated as to cry out, that he saw a cherub with a flaming sword guarding the door of the house where they were. Unluckily, however, they continued their assembly so long, and behaved in such a seditious manner, that the emperor sent against them a

Ethiopia.

312
Death of *Oustas*.313
Reign of *David*.314
Three Romish priests executed.315
Diffensions among the Abyssinian clergy.

body.

³¹⁶ **Ethiopia** body of pagan Galla; who falling upon them sword in hand, killed upwards of 100 of the ringleaders, and then falling out into the street destroyed indiscriminately every one they met.

³¹⁶ Great massacre of the clergy and others.

³¹⁷ The king poisoned.

³¹⁸ Reign of Bacuffa.

³¹⁹ Of Yafous II.

³²⁰ Applies himself to the arts of peace.

³²¹ Is ridiculed by his subjects, and undertakes an expedition against Sennaar.

³²² A division of his army cut off.

The massacre continued till the next day at noon, when a stop was put to it by the king's proclamation. The vast quantity of blood so wantonly shed, however, could not but occasion great discontent throughout the capital, and the bad effects of it soon appeared. The king was universally hated, and numberless conspiracies were talked of; but before any pretender to the crown appeared, David himself fell sick, the cause of which was found to be poison. The perpetrators of this crime being known, were instantly put to death; but nothing could save the life of the emperor, who died the 9th of March 1719 in great agony.

David was succeeded by his brother Bacuffa; who in the beginning of his reign proved very severe and cruel, cutting off almost all the nobility who could be supposed to have had any share in the conspiracies and seditions of former reigns. In the latter part of it he became much more mild, and was beloved by his subjects. He was succeeded in 1729 by his son Yafous II. who continued long under the regency of his mother; and as soon as he took the management of affairs upon himself, was disturbed with continual seditions and rebellions. In one of these the city of Gondar was made a field of battle, and was so frequently set on fire, as to be almost entirely reduced to ruins. Having at last succeeded in reducing all his enemies to obedience, he applied himself to the arts of peace, repairing and ornamenting his palaces, in which he employed some Greek artists. For this he renounced the diversion of hunting, and the barbarous expeditions against the Shangalla; but this way of life proved so disagreeable to his turbulent subjects, that a severe satire was published against him under the title of "The expeditions of Yafous the Little." Nettled at this reproach, he determined on an expedition against the kingdom of Sennaar; and having made the necessary preparations, invaded it with a formidable army, without the least pretence of provocation, or making any declaration of war. As he proceeded into the country of the enemy, he allowed his soldiers every where to exercise the greatest cruelties, to destroy every living creature with the sword, and every thing combustible with fire. Some of the Arabs joined him as he went along; many more fled from his presence; and a body of them tried to oppose him. These last were utterly defeated; and Yafous without delay prepared to march to Sennaar the capital of the kingdom. As he still went on, the king Baady being assisted by Hamis prince of a territory named *Dar Fowr*, surprised one division of his army so effectually, that they were all cut off to the number of 18,000. Yafous, however, still continued his destructive progress; though he gave over all thoughts of reducing the capital, or subduing the kingdom. He returned triumphant to Gondar, making a great show of the plunder he had acquired; though the dejected countenances of many of his army showed that they were by no means pleased with expeditions of this kind. The king himself was supposed to behold the distress of his subjects on this occasion with a malicious pleasure, on account of their impatience and turbulence in times

N^o 120.

of peace, and their forcing him into a war when he had no inclination for it. In a short time, however, the people were perfectly comforted for the loss of their brethren. In the late unfortunate action they had lost all those holy utensils, which it is usual in Abyssinia to carry into the field of battle in order to ensure victory. Among these was a true picture of the crown of thorns which was put upon our Saviour's head; some pieces of the cross upon which he suffered; a crucifix which had spoken on many occasions; with many other sacred relics of equal value. Soon after the battle all these were redeemed by the priests at an extravagant rate; no less than 8000 ounces of gold having been given for the speaking crucifix; and for the rest, we are to suppose a proportional price had been paid. On the arrival of this trumpery at Gondar, the greatest rejoicings were made, and Yafous was astonished at the people having so soon forgot the loss of their countrymen and relations.

Soon after these transactions the abuna died; but though it was customary for the Abyssinian monarchs to advance the money necessary to bring a new one from Alexandria, Yafous found himself obliged to lay a tax upon the churches for defraying it at this time, having spent all his ready money in repairing and ornamenting his palaces. Three priests, consigned to the care of as many Mahometan factors, were sent to Egypt for the new patriarch; but they were detained for some time by the naybe or prince of Masuah, who extorted from them one half of the money given by the emperor for bringing the abuna from Cairo. Yafous no sooner heard that they were detained at Masuah, than he sent orders to Suhul Michael governor of Tigre to refuse provisions to the inhabitants of Masuah, which would soon reduce the naybe to obedience: but as Michael intended soon to quarrel with the king himself, he was not in any haste to obey the orders he received. The travellers were therefore detained so long, that on their arrival at Jidda, they found they had lost the monsoon; and, what was worse, the scherif of Mecca would not allow them to pass without a fresh extortion. Their money was now exhausted; but the rapacious scherif put one of their number in prison, where he continued for a twelvemonth till the money arrived: and from this time these extortions were changed into a stated tribute; 75 ounces of gold (about L. 186 sterling) being granted for leave of passage to Cairo for the abuna; 90 ounces to the scherif, and as many to the naybe, for allowing the abuna to pass from Cairo; an agreement which subsists to this day. Several other insults of this kind being received from the naybe, Yafous at last discovered that there was a strict alliance betwixt him, the governor of Tigre, and the Baharnagash; any one of whom, had he thought proper, could have crushed this pitiful prince with the smallest effort. On this the emperor determined to march against him in person; but was prevented by a rebellion which had been purposely excited in the country of Azab and that of the Dobas. The rebels were easily overthrown: but thus the expedition against the Naybe was delayed for a year; during which interval the emperor sent for Michael to Gondar. This order was positively refused, and a war ensued. Michael, unable to contend with the emperor in the open field, took to a high mountain, the usual refuge of

Ethiopia.

³³² Religious

utensils re-

deemed at

an extrava-

gant rate.

³²⁴ The mes-

sengers sent

for the new

Abuna in-

sulted and

robbed.

³²⁵ A stated

tribute for

the passage

of the A-

buna.

³²⁶ The em-

peror deter-

mines to

punish the

Naybe of

Masuah,

but is pre-

vented.

³²⁷ War with

Michael

governor of

Abyssinian

Tigre.

Ethiopia. Abyssinian rebels. Here also his bad fortune pursued him; all his posts were taken by storm excepting one, which, it was evident, would likewise have been carried, though not without a very great expence of men.

328 Michael obliged to capitulate. Here Michael requested a capitulation; and to ensure favourable terms, he desired to put into the hands of Yafous a great quantity of treasure, which would otherwise be dissipated among the common soldiers. This being done, Michael descended with a stone upon his head, as confessing himself guilty of a capital crime, with a design to make submission to the emperor. This was prevented for one day by a violent storm of wind and rain; from which moment the Abyssinians believe he began to converse with the devil: but Mr Bruce informs us, that he has often heard him say it was Michael the archangel who was his correspondent.

329 Yafous is obliged to pardon him contrary to his own inclination. Yafous was firmly determined to put this rebel to death, notwithstanding the quantity of gold he had received; nevertheless a promise was extorted from him that he would grant him his life. As soon as Michael came into his presence, the emperor was filled with indignation, retracted his promise, and ordered him to be carried out and put to death before his tent-door. The execution of the sentence, however, was prevented by the intercession of all the officers of any consideration in the court or army. Such universal solicitation could not be withstood: Michael was pardoned; but with these remarkable words, that the emperor washed his hands of all the innocent blood which Michael should shed before he brought about the destruction of his country, which he knew he had been long meditating.

330 He is set at liberty and raised to the highest honours. Michael continued for some time in prison; but was afterwards set at liberty, and even restored to his government of Tigré. No sooner was he reinstated in this dignity, than collecting an army, he attacked Kasmati Woldo governor of Amhara, defeated him in two battles, and forced him to take refuge among the Galla, whom he soon after bribed to murder him. In other respects he behaved as a most dutiful subject, gave the king the best intelligence, and supplied him with soldiers better accoutred than he had ever before beheld. He was also more humble than before his misfortune; nor did an increase of his favour and influence make him deviate from the line he had prescribed. Having begun to gain friends by bribery, he continued to add one bribe to another to secure the old, and to gain new ones by the same means, pretending all the while to no kind of dignity or honour, not even to such as was justly due to his own rank. Thus he became such a favourite with the emperor, that he bestowed upon him the governments of Enderta and Sire, in addition to that of Tigré; so that he was now master of almost one half of Abyssinia. During the reign of Yafous, however, he attempted nothing. The foundations of the disturbances which succeeded were laid by the queen-mother, towards the end of the reign of Yafous. This emperor had been married when very young to a lady of Amhara, by whom he had two sons named Adigo and Aylo; but as his wife pretended to interfere in matters of state, he was persuaded by his mother to banish both her and her children to Wechne. After this his mother chose a wife for him from among the Galla; a people

331 Cause of the great civil war in Abyssinia.

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Ethiopia. of all others the most obnoxious to the Abyssinians, both on account of the horrid barbarity of their manners, and the continual wars which from time immemorial had taken place between the two nations. The new queen was the daughter of one Amitzo, a prince who had once hospitably entertained Bacuffa before he became emperor; and his people were esteemed the least barbarous of the whole. A prejudice against her, however, against her offspring, and the emperor himself, never to be effaced, now took place among the Abyssinians; but this did not show itself during the reign of Yafous. The emperor died on the 21st of June 1753, being the 24th year of his reign, not without suspicion of being poisoned by his mother's relations, who were now attempting to engross the whole power of the empire into their hands.

332 Death of Yafous. On the death of Yafous, his son Ioas by the Galla princess just mentioned succeeded to the throne without any opposition. The discontent which had taken place in the former reign about the power assumed by the relations of the old queen, now began to show itself more openly; and it was complained that a relationship to her was the only way to preferment, by which means the old families, whose merit had often saved the state, were totally excluded from every share of favour. On the accession of the young king, a party of Galla horse, said to be about 1200 in number, were sent as the portion of his mother; and these were quickly followed by a number of private persons from motives of curiosity, or hopes of preferment, who were embodied to the number of 600 into a troop of infantry, the command of which was given to Woosheka. The great favour in which these people were at court soon induced many others to make their appearance. Two of the king's uncles

333 Reign of Ioas. The Galla introduced into Abyssinia. Two of the king's uncles arrived, and engrossed all the power. were sent for by his express desire; and they brought along with them a troop of 1000 horse. By the time they arrived the queen was dead; but her two brothers, named *Brulhe* and *Lubo*, finding that the king put an entire confidence in them, determined to make a party at court. This was easily effected; every thing was governed by Gallas; even the king himself affected to speak their language; while the Abyssinians were to the last degree mortified at seeing their inveterate enemies thus establishing a dominion over them in the heart of their own country. At last the king thought proper to appoint his uncle *Lubo* to the government of Amhara; but this produced such excessive discontent, that he was fain to retract his nomination, lest a civil war should have ensued. While the empire was thus divided into two parties, *Suhul Michael* came to Gondar in a very splendid manner, on an application from the exiled prince of Sennaar to be restored to his kingdom. When conducted into the presence of the emperor, he prostrated himself before him, owned himself his vassal, and was put in possession of the government of Ras-el-Feel upon the frontiers, with a large revenue, where he was advised to stay till the disputes which subsisted at that time should subside. This salutary advice, however, he had not prudence to comply with; but suffering himself to be decoyed from his asylum into Atbara, was taken prisoner and murdered.

334 The Galla introduced into Abyssinia. 335 Two of the king's uncles arrive, and engross all the power. 336 *Suhul Michael* arrives at court. 337 King of Sennaar murdered. In the mean time, the Abyssinian prime minister, *Welled de l'Oul*, died. He had hitherto moderated

Ethiopia.

338
State of the
different
parties.

339
Brulhe
made go-
vernor of
Begemder.
340
An univer-
sal ferment
ensues.

341
Is opposed
by Mariam
Barea.

the fury of the opposite parties by his wife and prudent conduct; but no sooner was he taken out of the way, than a most dreadful scene of confusion and civil war took place, which raged with the utmost violence while Mr Bruce was in Abyssinia, and seemed not likely to come to any termination when he left it. The whole empire was divided into two great factions: at the head of the one was the old queen-mother of Yasous; and at the head of the other, Ioas himself the emperor, with his Galla relations. Matters were first brought to a crisis by the imprudence of the emperor himself in bestowing the government of Begemder upon Brulhe one of his Galla uncles. The government of this province had been lately resigned into the hands of the queen by an old officer named *Ayo*; and it was supposed that his son named *Mariam Barea*, universally allowed to be one of the most accomplished noblemen of the kingdom, was to succeed him in this government. This opinion was farther confirmed by the marriage of *Mariam* herself with *Ozoro Esther*, a daughter of the old queen by her second husband. Unfortunately a quarrel had happened between *Kasmati Ayo*, the old governor of Begemder, and *Suhul Michael*, a little before the resignation of the former, and continued undecided till *Mariam* took the office upon him. The occasion was quite trifling; nevertheless, as *Mariam* had refused to submit to the decision of the judges, whom he stigmatized as partial and unjust, insisting that the king should either decide the affair in person, or that it should be referred to the decision of the sword, he thus fell under the imputation of being a disobedient and rebellious subject. In consequence of this, *Ioas* looked upon him ever afterwards with an evil eye; and now deprived him, by proclamation, of the government of Begemder, giving it to his own Galla uncle *Brulhe*, of whom we have already made so much mention. This unexpected promotion threw the whole empire into a ferment. As Begemder was a frontier province bordering on the country of the Galla, there was not the least doubt, that, immediately on the accession of *Brulhe* to his new office, it would be over-run by that race of barbarians, remarkable for their savage manners almost beyond all the other nations in Africa. This was the more dangerous as there was not above a day's journey betwixt the frontiers of Begemder and Gondar, the capital of the whole empire. *Mariam Barea* herself, who had a high sense of honour, was particularly hurt at the manner in which he was deprived of his dignity, and condemned with his family to be subject to a race of Pagans, whom he had often defeated in battle, and obliged to acknowledge him as their superior. All remonstrance, however, was vain. *Brulhe*, under the sanction of the imperial command, advanced with an army to take possession of his new dignity: but so exceedingly averse were the Abyssinians to follow him in this expedition, that the army disbanded itself several times after it had been collected; and it took up almost a year before he could proceed from the place where his camp was, at the lake *Tzana* or *Dembea*, to the frontiers of Begemder, though scarce half a day's journey distant. *Mariam Barea* beheld his operations with great contempt, employing his time in the dispatch of ordinary business, and endeavouring to reconcile himself to the king, but without success. As his last effort, he sent a remonstrance to

the emperor; in which, after many protestations of duty and obedience, he reminded him, that, at his investiture into the office of governor of Begemder, he had sworn not to allow any of the Galla to enter his province: that, should he deviate from the observance of this oath, the safety of the princes in Wackne would be endangered; they would constantly be liable to the invasions of the Pagans, and probably be extirpated, as had already happened at two different times: and he begged of the emperor, if he was determined to deprive him of his government, to bestow it rather upon some Abyssinian nobleman; in which case he promised to retire, and live in private with his old father. He had, however, formed a resolution, which he thought it his duty to submit to the emperor, that if his majesty should think proper to come, at the head of a Galla army, to invade his province, he would retire to the farthest extremity of it, till he was stopped by the country of the Galla themselves; and, so far from molesting the royal army, he might be assured, that though his own men might be straitened, every kind of provision should be left for his majesty. But if an army of Galla, commanded by one of that nation, should enter the province, he would fight them at the well of Fernay, on the frontiers, before one of them should drink there, or advance the length of a pike into the province.

This remonstrance had no effect upon the emperor. He returned a scoffing answer, announcing the speedy arrival of *Brulhe*, whom he thought sure of victory: but, at the same time, to show that he did not put his confidence entirely in his prowess, he created *Suhul Michael* governor of *Samen*, which lay next to *Tigré* in the way to *Samen*, so that no obstruction might lie in the way of that officer's march to Gondar, in case there should be any occasion for him. *Mariam*, provoked at the manner in which he was undervalued in the king's message, gave an ironical reply, in which he alluded to the name of *Brulhe*, in the Abyssinian language signifying a kind of bottle; this he told him would be broken on the rocks of Begemder, if sent into that country.

On receiving this last message from *Mariam*, the king instantly ordered the army to be put in motion; but the Abyssinians had unanimously determined not to act offensively against their countrymen. *Brulhe* therefore was left to decide the affair with his Galla. *Mariam* kept exactly to his word in the declaration he had made to the king, not stirring out of his province, nor allowing the least attempt to be made to harass his enemy, till they were drawn up at the well above mentioned, where he met them with his army. The Galla, unsupported by the Abyssinian troops, were utterly unable to bear the shock of *Mariam's* army, and therefore soon betook themselves to flight; but a part of them, who were surrounded by the cavalry, fought valiantly till they were all cut to pieces. *Mariam* had given the most express orders to take *Brulhe* alive; or, if that could not be done, to allow him to make his escape. One of his servants, however, observing him in the field, pushed up through the enemy to the place where he was, and running him twice through with a lance, left him dead on the spot.

Mariam Barea was no sooner informed of the death of his rival, than he cried out in great emotion, that

Ethiopia.

344
Michael
created Ras.345
Commits
great de-
vastations.346
Arrives at
Gondar.347
Executes
justice im-
partially.

Suhul Michael, with the whole army from Tigré, would attack him before autumn. In this he was not deceived. Ioas instantly dispatched an express for Michael, ordering his attendance, and investing him with the dignity of Ras, by which he became possessed of unlimited power both civil and military. Michael himself had for a long time seen that matters would come to this crisis at last, and had provided for it accordingly. He now set out with an army of 26,000 men, all of them the best soldiers in the empire, and 10,000 of them armed with muskets. As he passed along, his troops desolated the country wherever they came, but he encumbered his army by nothing useless; allowing his men to carry along with them neither women, tents, beasts of burden, nor even provisions. The subsistence of his troops was abundantly provided for by the miserable inhabitants of the provinces thro' which he passed; and, not satisfied with this, he insisted on a contribution in money from all the districts within a day's march of those places where he was; the least delay was followed by the slaughter of the inhabitants and destruction of their houses. Towns, villages, and buildings of every kind, were set on fire as he passed along; the people fled from all quarters to the capital for refuge, as from the face of the most inveterate enemy; and Ioas himself was now sensible of his having been in the wrong to invest him with such unlimited power. On his arrival at the capital, Michael took possession of all the avenues, as if he meant to besiege it; so that an universal consternation ensued. Instead of offering any hostility, however, he waited with the utmost respect on the emperor, proceeding immediately from the royal presence to his own house, where he sat in judgment, as the nature of his office required him to do. No sooner had he taken upon him this new office, however, than he executed justice in such a rigorous and impartial manner as made the boldest offenders tremble. Some parties of his own soldiers, presuming upon the licence that had hitherto been granted them, entered Gondar and began to plunder as they had done in other places; but, on the very first complaint, their commander caused 12 of them to be apprehended and hanged. Their execution was followed by 50 others in different quarters of the city; after which he gave the charge of the capital to three officers who were to preside over three quarters, himself taking care of the fourth. Two civil judges were appointed to assist each officer in a district, two were left in the king's house, and four of them held a court of judicature in his own. Thus the inhabitants, finding, that instead of bloodshed and massacre, they were to expect nothing but strict equity and moderation, became reconciled to Michael the day after his arrival, and lamented only that he had not come sooner to relieve them from the anarchy and confusion in which they had been held so long. To so great a degree of perfection indeed did he bring his legislation, that a very short time after he entered the city, a loaf of bread, a bottle of water, and an ounce of gold, were exposed in the market-place on the head of a drum night and day for some time, without any one offering to take them away. This was the more remarkable as there was then a scarcity of provisions, and Michael himself would allow but a very scanty supply of water to be carried into the city;

thereby giving the inhabitants to understand, that if he should set fire to it as he had done to other places, it would not be in their power to quench the flames.

The capital being thus secured in perfect obedience, Michael next prepared to set out on his expedition against Mariam Barea. Sensible, however, that the destruction of this worthy nobleman would be attended with a great degree of odium, he was resolved that none of it, or at least as little as possible, should fall upon himself. For this purpose, he insisted that the emperor should march in person from Gondar, and carry all his soldiers along with him. Thus he had an opportunity of throwing the whole blame upon Ioas, and representing himself as no more than a passive instrument in the affair. He also took every occasion of praising his antagonist for his virtues, and censuring the emperor for attempting to cut off such an excellent officer.

In the mean time Mariam Barea keeping exactly to the terms of the last remonstrance he had sent to Ioas, retired before him to the extremity of the province. Ioas and Michael advanced furiously, burning and destroying every thing as they went along. An engagement at last took place at a place called *Nefas Musa*, on the extreme borders of Begemder, when Mariam could not retreat without going out of the province. As the royal army was more than twice the number of the other, and commanded by an officer of superior skill, victory was not long of being decided in its favour. Mariam, with 12 of his officers, took refuge in the country of the Galla; but were immediately delivered up by that faithless people. He was put to death by Lubo the brother of Brulhe, who is said with his own hands to have cut his throat as a sheep, and is commonly killed in this country, and afterwards to have disfigured the body in a shocking manner. The head was cut off, and carried to Michael's tent, who would not allow it to be uncovered in his presence. It was afterwards sent to the family of Brulhe in the country of the Galla, to show them what attention had been given to revenge his death; and this displeased the Abyssinians even more than any thing that had yet happened since the beginning of the contest. The 12 officers, who were taken along with him, sought protection in the tent of Ras Michael, to which they were suffered to escape by Woosheka their keeper. Lubo, however, intended likewise to have sacrificed them as he had done Mariam, and therefore sent Woosheka to demand them: but no sooner had he unfolded his errand, than Michael in a rage, called to his attendants to cut him in pieces before the tent-door; which would certainly have been done, had he not fled with the utmost precipitation.

The scandalous ascendancy which the Galla always manifested over the king, had greatly displeased Michael; who expressed himself so freely on the subject, that a coolness took place between them. Another officer named *Waragna Fasil*, a Galla by birth, had insinuated himself into the king's favour, and greatly distinguished himself at the battle of *Nefas Musa*. It was no wonder, therefore, that he soon became a rival to Michael; and this rivalry was greatly augmented by the following circumstance. Near the field of battle at *Nefas Musa* was a

Ethiopia.

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Marches
against Ma-
riam Barea.

349

Mariam de-
feated.

350

Betrayed
by the Gal-
la, and
cruelly
murdered.

351

Some of his
officers pro-
tested by
Michael.

352

Disagree-
ment be-
tween the
king and
Michael.

Ethiopia. house of Mariam Barea, where Ozoro Esther his widow now was. Being surrounded by pleasant and verdant meadows, Fasil encamped there for the sake of his cavalry. No other design was at that time apparent; however, his presence greatly alarmed the princess. She had along with her at that time a nobleman named *Aylo Aylo*, who had been at the battle of Sennaar; but had there been terrified to such a degree, that he resolved to renounce the world ever after and turn monk. In this character he was now with Ozoro Esther; and though he refused to be concerned in any military affairs, he was still consulted by both parties as a kind of oracle. In the present emergency, therefore, he told the princess that there was only one way by which she could secure herself from the cruelty of the Galla, and becoming a prey to one or other of the murderers of her husband; and that was by immediately espousing Ras Michael. Ozoro was perfectly sensible of the propriety of the advice, and therefore set out next morning in company with Aylo to Michael's tent. Here she threw herself at his feet on the ground; and refusing to rise, Aylo explained her errand, informing the Ras that she intended to bestow herself upon him in marriage, as being the only person not guilty of her former husband's death capable of affording her protection in her present situation. Michael saw clearly the advantages attending such a match; and therefore having caused the army to be drawn up in order of battle, as if for a review, he sent for a priest, and was married to the princess in the sight of all his men. The ceremony was followed by the loud acclamations of the whole army; and Ioas was soon informed of the reason. He expressed his displeasure at the match, however, in such unequivocal terms, that a mutual hatred commenced from that moment. This was soon made public by a very trifling accident. One day while the army was marching, Michael being much incommoded by the sun which affected his eyes, threw a white handkerchief over his head to keep off the heat. This was instantly told the king, who took it as an affront offered to himself; for in Abyssinia it is unlawful to cover the head on any occasion whatever in presence of the emperor, or even within sight of the palace where he lodges. Ioas was no sooner informed of the supposed affront, than he sent to the Ras to know upon what account he presumed to cover his head in his presence; but though the covering was instantly taken off, it was thought that no atonement could ever be made for such a grievous offence. Soon after this a quarrel happening between Fasil and a person named *Gusbo*, likewise a man of great consequence, complaint was made to the Ras, who, as civil judge, summoned both parties before him. Fasil absolutely refused to obey any such jurisdiction; and the affair being laid before the other judges, it was given in favour of Michael, and Fasil declared to be in rebellion. This was followed by a proclamation depriving him of his government of Damot, and every other public office he held. Fasil, however, had no mind to submit to this disgrace; and therefore, after holding a long conference with the king, departed with his army, encamping on the high road betwixt Damot and Gondar, where he intercepted the provisions coming from the southward to the capital. This was followed by an attempt to assassinate the Ras. A shot was fired from one of the windows of the palace into

the house where he sat in judgment; the distance being so small, that he could easily be seen from the palace while thus employed. The ball, however, missed Michael, but killed a dwarf who was standing before him fanning the flies from his face. As it was evident that this shot must have been fired with the knowledge of the king, it was rightly judged to be the commencement of hostilities. Ioas instantly removed to a distance, but sent Woosheka with orders to the Ras to return to Tigré without seeing his face; declaring, at the same time, his own uncle Lubo governor of Begemder and Amhara. Michael could scarcely be prevailed upon to see Woosheka, and told him that he should certainly be put to death the next time he appeared in his presence. Next day Ioas sent a message to the Ras by four judges, commanding him to return to Tigré without the least delay, under pain of his highest displeasure. Michael returned a formal answer, concluding, that he expected the king himself to be ready to march against Fasil to-morrow. To this an absolute refusal was given; on which Michael issued a proclamation, commanding all the Galla to leave the capital next day under pain of death: in case of disobedience they were declared outlaws, and liable to be killed by the first that met them if they were found 24 hours after the proclamation in the capital, or to the same penalty if they were found in the kingdom after ten days. An engagement took place a short time after, in which Fasil was totally defeated, and obliged to retire into Damot. In this engagement some of the king's black horse were taken. These are all slaves, and subject to no other commands but those of his majesty himself. The appearance of them therefore showed that they must have been sent by the king to fight against the Ras. All of them were therefore brought before the latter, and interrogated by whose orders they had come to the battle. Two refused to give any answer, and had their throats cut in presence of their companions. A third plainly told him that they had been sent by the king; who had likewise ordered an Armenian to fire out of the palace window at Ras Michael. On this the prisoners were dismissed; but assassins instantly dispatched to put an end to the king's life; which they accomplished, and buried him in a church dedicated to St Raphael.

On the death of Ioas, Michael, now absolute master of Abyssinia, set up for emperor Hannes, brother to the late king Bacuffa, an old man who had resided almost all his lifetime on the mountain of Wechne, and being entirely unacquainted with the affairs of the world was on this account probably supposed by Michael to be the more proper for his purposes. Hannes had been maimed by the loss of his hand, on purpose to incapacitate him for the throne; but this objection was laughed at by the Ras. He found him, however, possessed of a quality much more inimical to his own purposes; and that was, an absolute aversion at meddling with the affairs of government: so that he could not by any means be induced to take the field against Fasil. Michael therefore was obliged to set out by himself; but thinking it improper to leave a king of any kind behind him in the capital, he had the old man poisoned before his departure; putting his son Tecla Haimanout in his place.

The young emperor, according to Mr Bruce's account,

353
Michael
marries the
princess
Ozoro Esther.

354
Final quar-
rel betwixt
Michael
and Fasil.

355
A shot fired
at Michael
from the
palace win-
dow.

356
Fasil defeat-
ed by Mi-
chael.

357
Ioas assassi-
nated.

358
Hannes set
up by Mi-
chael, and
soon after
poisoned.

Ethiopia.
359
Reign of
Tecla Hai-
marout.

360
Fasil defeat-
ed.

361
Mr Bruce's
arrival and
adventures
in Abyf-
sinia.

362
Sets out
from Ar-
keeko.

count, was of a fair complexion, less tawny than a Neapolitan or Portuguese, owing to his having been born in the mountain. He was endowed with many princely accomplishments; and so much attached to Michael Ras, that he called him *Father* from the time of his accession, waiting upon him when indisposed with the affection of a son. There being now no objection therefore, Michael marched against Fasil with out delay, and entirely defeated him on the 3d of December 1769. On this occasion Woosheka was taken prisoner, and afterwards dead alive, notwithstanding the intercession of some of Michael's officers for him; his skin being afterwards formed into a bottle. This piece of cruelty was attributed to Ozoro Esther; whom Mr Bruce represents as the most humane and merciful of women; though he is obliged to allow that on the present occasion, as well as on every other which regarded her former husband, she entirely forgot her character. The night on which this miserable victim was destroyed, she appeared in the king's tent dressed like a bride; and in a little time returned in triumph to Gondar.

Soon after these transactions, Mr Bruce entered Abyssinia. He arrived at Masuah when there was only a report of Hannes's being ill, and Mr Bruce was supposed to be his physician, though in truth that emperor was already dead. Here he was ill-treated by the naybe, with a design to extort money, and afterwards probably to put him to death, as was his custom with other strangers. He escaped the danger, however, by the protection of Achmet, nephew and heir apparent to the naybe; and by his own prudent and resolute behaviour, threatening his adversaries with the arrival of a British man of war in case of any injury; showing the Grand Signior's protection; making use of the name of Ras Michael, now so formidable, and to whom he had obtained a recommendation, &c. After many vexations and delays, he was at last allowed to depart; and a guide, by name *Saloome*, was sent along with him. This man was brother-in-law to the naybe, and a professed Christian; but a traitor in his heart, and who wished to do every thing in his power to hurt our traveller. He was furnished with another guide, however, by his friend Achmet, to inform him where to pitch his tent, and other necessary particulars.

On the 15th of November 1769 Mr Bruce left Arkeeko on the eastern coast of Africa, and proceeded southward for Gondar the capital of Abyssinia. After an hour's journey, he pitched his tent near a pit full of rain-water, where he remained all day; and in the evening a messenger arrived from the naybe, who took away the guide *Saloome*. Next day the latter returned in company with Achmet the naybe's nephew, already mentioned. The latter caused him deposit in his hands *Saloome's* full hire, as though he had gone the whole length he had promised. Four of the men were commanded to go back to Arkeeko, and others put in their place: after which Achmet told Mr Bruce, that he was not to take the road through Dobarwa, though near, because it belonged to the naybe; but that *Saloome* knew another by a place called *Dixan*, which belonged to himself, and where he could ensure him of a good reception. In this journey he told him, that he would be obliged to cross the mountain of Taranta, the highest in Abyf-

sinia; but the fatigue of this would be more than recompensed by the assurance of safety and the curiosity of the place. Taking leave of Achmet in a very friendly manner, therefore, Mr Bruce with his company finally set out on their journey the evening of the 16th. For the short space they had travelled, the ground was covered with grass broader in the leaf than ours; but in a little time the soil became hard, dry, gravelly, and full of acacia or Egyptian thorn. Next day (17th) they changed their course from south to west; and soon arrived at a range of mountains standing so close to one another, that there was no passage between them excepting what was worn by torrents of water; the bed of one of which consequently now became their road. In the evening they pitched their tent at some distance from this torrent, which had scarcely any water in it when they left it; but all the afternoon there had been an appearance of rain, with much thunder and lightning, at a distance. On a sudden they heard a noise among the mountains louder than thunder; and instantly saw the torrent, swelled immensely by the distant rains, now running like a rapid river, and the foremost part of it advancing in its bed in a body of water about the height of a man. Having run for some time in this violent manner, the current, no longer supplied by the rains, began to diminish, and by the next morning was quite gone. Among these mountains the nights are cold even in summer.

On the 18th the journey was resumed in the bed of the torrent, which now scarcely had any water; though the stones were rendered very slippery by the quantity of rain which had fallen. Leaving this disagreeable road, they came to a fine rivulet; which being the first clear water they had seen from the time Mr Bruce left Syria, was exceedingly agreeable. They proceeded along the banks of this river for some time; and soon after leaving it, they came to another of the same kind: but next day were obliged to resume their course in the bed of a torrent. The mountains in this part of the world are excessively rugged and full of precipices, entirely destitute of soil, and covered with loose stones of a black colour. On the side of the torrent in which they marched, however, there grew very large sycamore trees, some of them little less than 7½ feet in diameter. Their branches afforded shelter to an infinite number of birds; many of them without song; but others having notes very different from the European kinds, and peculiar to the continent of Africa. Most of those which had very beautiful colours were of the jay or magpie kind. The trees were loaded with figs; but they come to nothing, by reason of the ignorance of the savages, who know not the process of caprification. The streams of water themselves, which at this season were found so delightful, run only after October: they appear on the east side of the mountains when the summer rains in Abyssinia are ceasing; at other times, no water is to be met with, excepting what is contained in stagnant pools.

On the 20th of November they began to ascend the high mountain of Taranta. Their road was now excessively rugged and uneven, intersected with monstrous gullies and holes made by the torrents, as well as by huge fragments of rocks tumbled down by the torrents. It was with the utmost difficulty that they could

Ethiopia.

363
Account of
the country
through
which he
passed.

364
Sudden
swell of a
torrent.

365
Notes of
the African
birds dif-
ferent from
those of
Europe.

366
Account of
the moun-
tain Taranta.

^{Ethiopia.} could carry the astronomical instruments up this hill; in which work Mr Bruce himself, and one of his attendants named *Tafine*, a Moor, bore a principal share. The only misfortune they met with was, that their asses being unloaded, and committed to the care of a single person, refused to ascend this barren mountain; and in spite of all that their driver could do, set off at a brisk trot for the fertile plains below. Luckily, however, they were afterwards recovered by four Moors sent after them, and the journey resumed without any material interruption. The beasts were now become much more tractable, having been seen and pursued by the hyænas with which that mountain abounds.

Taranta is so destitute of earth, that there was no possibility of pitching a tent upon it; so that our travellers were obliged to take up their lodging in one of the caves with which it abounds. The under part of the mountain produces in great plenty the tree called *Kolquall*, which was here observed in greater perfection than in any other place throughout the whole journey. The middle part produced olives which carried no fruit; and the upper part was covered with the oxycedras or Virginia cedar, called *arze* in the language of the country. On the top is a small village named *Halai*, inhabited by poor shepherds, who keep the flocks of the rich people of the town of Dixan below. They are of a dark complexion, inclining to yellow; their hair black, and curled artificially by means of a stick, and which our author supposes to be the same with the *crisping-pin* mentioned Isa. iii. 22. The men have a girdle of coarse cotton-cloth, swathed six times round their middle; and they carry along with them two lances, and a shield made of bulls' hides. Besides these weapons, they have in their girdles a crooked knife with a blade about 16 inches in length, and three in breadth at the lower part. There is here great plenty of cattle of all kinds; the cows generally of a milk white, with dew-laps hanging down to their knees; their horns wide like those of the Lincolnshire cattle; and their hair like silk. The sheep are all black both here and throughout the province of Tigré; having hair upon them instead of wool, like the rest of the sheep within the tropics; but remarkable for its lustre and softness, without any bristly quality. On the top of the mountain is a plain, which, at the time our author was there, they had sown with wheat. The air seemed excessively cold, though the barometer was not below 59° in the evening. On the west side the cedars, which on other parts are very beautiful, degenerate into small shrubs and bushes.

367
Of the vil-
lage Halai,
and inhabi-
tants of the
mountains.

368
Beautiful
cattle, &c.

369
Town of
Dixan de-
scribed.

The road down this mountain was for some time nothing inferior in ruggedness to what they had met with in ascending it; but as they approached Dixan, it became considerably better. This is the first town on the Abyssinian side of Taranta. It is seated on the top of an hill of a form exactly conical, surrounded by a deep valley like a ditch; and no access to it but by a path which winds round the hill. The inhabitants were formerly exterminated by Michael Ras; and the succeeding race, in Mr Bruce's time, were of a very indifferent character, being, as he says, composed of the worst people from the territories of the Baharnagash and the province of Tigré, on both of

which it borders. Here he was in danger from the treachery of Saloome, who wished to have decoyed him into the power of some assassins. Finding that this could not be done, he surrounded Mr Bruce and his retinue with a body of armed men; but they were dispersed by the authority of Hagi Abdelcader, the friend of Achmet, who had received orders to provide for the safety of the travellers. The only trade carried on here is that of buying and selling slaves; who are stolen from Abyssinia, chiefly by the priests, and sent into Arabia and India.

The next stage was from Dixan to Adowa, capital of the province of Tigré. Leaving Dixan on the 25th of November, they pitched their tent the first night under a large spreading tree called *Daroo*, which Mr Bruce says was one of the finest he saw in Abyssinia, being about 7½ feet in diameter. They had been joined by some Moors driving 20 loaded asses and two bulls, which in that country are likewise used as beasts of burden. Here, our author says, he recovered a tranquillity of mind which he had not enjoyed since his arrival at Masuah; but they were now entirely without the dominions of the naybe, and entered into those of the emperor. Saloome attended them for some way, and seemed disposed to proceed; but one of the company, who belonged to the Abyssinian monarch, having made a mark in the ground with his knife, told him, that if he proceeded one step beyond that, he would bind him hand and foot, and leave him to be devoured by wild beasts.

Being now in a great measure delivered from their fears and embarrassments, the company proceeded on their journey with pleasure, through a much better country than they had hitherto passed. In some places it was covered with wild oats, wood, high bent-grass, &c. but, in not a few places, rocky and uneven. Great flocks of a bird as large as a turkey, called, in the Amharic language, *Erkoom*, were seen in some places. A large animal of the goat kind, called *Agazan*, was found dead and newly killed by a lion. It was about the size of a large ass, and afforded a plentiful repast. Numbers of kolquall trees were also seen; and the sides of the river Habesh were adorned with a beautiful tree of the same name with the stream. There were in this place also many flowers of various kinds, particularly jessamine. The mountains of Adowa, which they came in sight of on the 5th of December, are totally unlike any thing to be met with in Europe; their sides being all perpendicular rocks, like steeples or obelisks of many different forms.

Adowa, though the capital of an extensive province or kingdom, does not contain above 300 houses; but occupies nevertheless a large space, by reason of the inclosures of a tree called *Wanzey*, which surrounds each of the houses. It stands on the declivity of a hill, situated on the west side of a small plain surrounded by mountains. It is watered by three rivulets which never become dry even in the greatest heats. A manufacture is carried on here of a kind of coarse cotton cloth, which passes for money throughout all Abyssinia. The houses are built of rough stone cemented with mud; lime being only used in the construction of those at Gondar, and even there it is very bad.

Our traveller was very hospitably entertained at Adowa

370
Journey to
Adowa, the
capital of
Tigré.

371
His trea-
cherous
guide obli-
ged to re-
turn.

372
The coun-
try be-
comes more
fertile as he
passes a-
long.

373
Adowa de-
scribed.

374
Visits the
ruins of
Axum.

Ethiopia. Adowa by one Janni, with whom he resided during his stay there. Leaving it on the 17th of December, he visited the ruins of Axum, once the capital of the empire. Here are 40 obelisks, but without any hieroglyphics. A large one still remains, but the two largest are fallen. There is also a curious obelisk, of which he gives a figure, with other antiquities which our limits will not allow us to enlarge upon. The town has at present about 600 houses, and carries on manufactures of the coarse cotton-cloth already mentioned. It is watered by a small stream which flows all the year, and is received into a fine basin 150 feet square, where it is collected for the use of the neighbouring gardens. Its latitude was found by Mr Bruce to be $14^{\circ} 6' 36''$ north.

On the 20th of January 1770, our traveller set out from Axum. The road was at first smooth and pleasant, but afterwards very difficult; being composed of stones raised one above another, the remains of a magnificent causeway, as he conjectures. As they passed farther on, however, the air was every where perfumed by a vast number of flowers of different kinds, particularly jessamine. One species of this, named *Agam*, was found in such plenty, that almost all the adjacent hills were covered by it; the whole country had the most beautiful appearance; the weather was exquisitely fine, and the temperature of the air agreeable. In this fine country, however, Mr Bruce had the first opportunity of beholding the horrible barbarity of the Abyssinians in cutting off pieces of flesh from the bodies of living animals, and devouring them raw; but notwithstanding this extreme cruelty, they have the utmost horror and religious aversion at pork of every kind; insomuch that Mr Bruce durst not venture to taste the flesh of a wild boar, just after having assisted in the destruction of five or six.

During the remaining part of the journey from Adowa to Sirè, the country continued equally beautiful, and the variety of flowers and trees greatly augmented; but as a report was propagated that Ras Michael had been defeated by Fasil, they now met with some insults. These, however, were but trifling; and on the 22d in the evening they arrived safely at Sirè, situated in N. Lat. $14^{\circ} 4' 35''$.

This town is still larger than Axum: but the houses are built of no better materials than clay, and covered with thatch; the roofs being in the form of cones, which indeed is the shape of all those in Abyssinia. It stands on the brink of a very steep and narrow valley, through which the road is almost impassable. It is famous for a manufacture of cotton-cloth, which, as we have already observed, passes for money throughout the whole empire. At some times, however, beads, needles, antimony, and incense, will pass in the same way. The country in the neighbourhood is extremely fine; but the inhabitants subject, by reason of the low situation, to putrid fevers. On leaving it on the 24th, our travellers passed through a vast plain, where they could discern no hills as far as the eye could reach, excepting some few detached ones standing on the plain, covered with high grass, which the inhabitants were then burning. The country to the northward is flat and open. In the way to Gondar, however, lie that ridge of mountains called *Samen*; of which one named *Lamalmom* is the most remarkable, and by some supposed to be the highest in Abyssinia. Betwixt Sirè and these

mountains the river Tacazze runs, which, next to the Nile, is the largest in Abyssinia. Mr Bruce informs us that it carries near one third of the water which falls on the whole empire; and when passing it, he saw the marks of its stream, the preceding year, 18 feet perpendicular above the bottom; nor could it be ascertained whether this was the highest point to which it had reached. It has its source in the district of Angot, rising from three sources like the Nile, in a flat country, about 200 miles to the S. E. of Gondar. It is extremely pleasant; being shaded with fine lofty trees, the water extremely clear, and the banks adorned with the most fragrant flowers. At the ford where they crossed, this river was fully 200 yards broad, and about three feet deep; running very swiftly over a bottom of pebbles. At the very edge of the water the banks were covered with tamarisks, behind which grew tall and stately trees, that never lose their leaves. It abounds with fish, and is inhabited by crocodiles and hippopotami; the former of which frequently carry off people who attempt to cross the river upon blown up skins. The neighbouring woods are full of lions and hyænas. The Tacazze is marked by Mr Bruce in his map as a branch of the Astaboras, which falls into the Nile. The latitude of the ford was found to be $13^{\circ} 42' 45''$.

This river was passed on the 26th of January; after which our travellers entered into the country of Samen; the governor of which, Ayto Tesfos, had never acknowledged the authority of Ras Michael, nor any of the emperors set up by him since the death of Ioas. The country therefore was hostile; but the uncertainty of the event of the war, and the well-known severity of Michael's disposition, preserved our traveller and his company from any insult, excepting a feeble and unsuccessful attempt to extort money. Here Mr Bruce observes that the people were more flat-nosed than any he had hitherto seen in Abyssinia. The path among the mountains was for the most part exceedingly dangerous, having a precipice of vast height close by it which way soever you turn. The mountains appeared of very extraordinary shapes; some being like cones; others high and pointed like columns, pyramids, or obelisks. In one place a village was observed in such a dangerous situation, that scarce the distance of a yard intervened between the houses and a dreadful precipice. Below it is a plain of about a mile square, covered with citron and lemon trees. A river named *Mai-Lumi* rises above this village, and falls into the wood, where it divides in two; one branch surrounding the north and the other the south part of the plains; then falling down a rock on each side, they unite; and having run about a quarter of a mile farther, the stream is precipitated in a cataract 150 feet high. The lions and hyænas were very numerous among these mountains, and devoured one of the best mules our travellers had. The hyænas were so bold, that they stalked about as familiarly as dogs, and were not intimidated by the discharge of fire-arms. Their voracity was such, that they eat the bodies of those of their own species which our travellers had killed in their own defence.

On the 7th of February they began to ascend *Lamalmom* by a winding path scarcely two feet broad, on the brink of a dreadful precipice, and frequently intersected by the beds of torrents, which produced vast irregular chasms in it. After an ascent of two hours,

Ethiopia.
377
Tacazze river described.

375
Monstrous
barbarity of
the Abyssinians.

376
Sirè described.

378
Mountainous country of Samen described.

379
Extreme voracity of the hyænas.

380
Lamalmom mountain described.

attended.

³⁸¹ **Ethiopia.** attended with incredible toil, up this narrow path, they came to a small plain named *Kedus* or *St Michael*, from a church of that name situated there. This plain is situated at the foot of a steep cliff, terminating the western side of the mountain, which is as perpendicular as a wall, with a few trees on the top. Two streams of water fall down this cliff into a wood at the bottom; and as they continue all the year round, the plain is thus preserved in continual verdure. The air is extremely wholesome and pleasant. On ascending to the very top of the mountain, where they arrived on the 9th of February, our travellers were surprised to find, that though from below it had the appearance of being sharp-pointed, it was in reality a large plain, full of springs, which are the sources of most rivers in this part of Abyssinia. These springs boil out of the earth, sending forth such quantities of water as are sufficient to turn a mill. A perpetual verdure prevails; and it is entirely owing to indolence in the husbandman if he has not three harvests annually. The Lamalmon stands on the north-west part of the mountains of Samen; but though higher than the mountains of Tigré, our author is of opinion that it is considerably inferior to those which are situated on the south-east. The plain on the top is altogether impregnable to an army, both by reason of its situation and the plenty of provisions it affords for the maintenance of its inhabitants; even the streams on the top are full of fish. Here the mercury in the barometer stood at 20 $\frac{7}{8}$ inches.

³⁸¹ Journey to Gondar.

³⁸² Mischief done by ants.

³⁸³ Arrival at Gondar.

During the time our travellers remained at Lamalmon, a servant of Ras Michael arrived to conduct them safely to the capital, bringing a certain account of the victory over Fasil; so that now the difficulties and dangers of their journey were over. The country appeared better cultivated as they approached the capital; and they saw several plantations of sugar-canes, which there grow from the seed. In some places, however, particularly in Woggora, great damage is done by swarms of ants, rats, and mice, which destroy the fruits of the earth. Mr Bruce had already experienced the mischief arising from a small species of ant, whose bite was not only more painful than the sting of a scorpion, but issued out of the ground in such numbers as to cut in pieces the carpets and every thing made of soft materials to which they could have access.

When Mr Bruce approached the capital, he was dressed like a Moor: and this dress he was advised to keep until he should receive some protection from government; his greatest, indeed his only, danger arising from the priests, who were alarmed at hearing of the approach of a Frank to the capital. This was the more necessary, as the emperor and Michael Ras were both out of town. For this reason also he took up his residence in the Moorish town at Gondar; which is very large, containing not fewer than 3000 houses. The only inconvenience he underwent here was the not being allowed to eat any flesh: for we have already taken notice of a law made by one of the emperors, that none of his subjects should eat flesh but such as had been killed by Christians; and a deviation from this would have been accounted equal to a renunciation of Christianity itself. Here he remained till the 15th of February; when Ayto Aylo waited upon him, and addressed him in the character of physician, which he

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had assumed. By this nobleman he was carried to the palace of Koscam, and introduced to the old queen. His advice was required for one of the royal family who was ill of the small-pox; but a faint had already undertaken his cure. The event, however, proved unfortunate; the patient died, and the faint lost his reputation. Our limits will not allow us to give any particular account of the steps by which Mr Bruce arrived at the high degree of reputation which he enjoyed in Abyssinia. In general his success in the practice of medicine, his skill in horsemanship, and the use of fire-arms, which by his own account must be very extraordinary; his prudence in evading religious disputes; as well as his personal intrepidity and presence of mind, which never once failed him, even in the greatest emergencies; all conspired to render him agreeable to people of every denomination. By the king he was promoted to the government of Ras-el-Feel, was his constant attendant on all occasions, and was with him in several military expeditions; but never met with any opportunity of distinguishing his personal valour, though he had the command of a body of horse at one of the battles fought at a place named *Serbruxos*. Thus honoured and employed, he had an ample opportunity of exploring the sources and cataracts of the Nile, as well as the geography and natural products of the whole country; obtaining also leave at last to return home. We cannot, however, praise the benevolence of his spirit at his departure. It has already been observed, that he was in some danger from the priests on his first arrival, on account of their suspecting him to be a Jesuit; for that is the meaning which they affix to the word *Frank* or *European*. As he constantly attended the established worship of the country, however, and carefully avoided all disputes on the subject of religion, he became at last not only unsuspected, but very intimate with many of the principal ecclesiastics. From one of these, named *Tensa Christos*, he asked a benediction immediately before he departed; which piece of unexpected humility so affected the priest, that it brought tears in his eyes. The benediction was conveyed in the simple form, "God bless you." A troop of inferior priests who attended would needs bless him also; and probably were pleased at having it in their power to bestow a benediction publicly on a man of such consequence: but to the blessings of these poor monks Mr Bruce replied in *English*, "Lord send you all a halter, as he did Abba Salama!" This Abba Salama had been an ecclesiastic of great consequence; but of a very dissolute life, and at last hanged for his crimes. The monks imagined he had been recommending them to their patriarch Abba Salama, and with great devotion answered "Amen."

The history of the war after Mr Bruce's arrival is related at great length in his work. The king Tecla Haimanout still kept his ground, and was at last acknowledged by almost the whole empire, though success did not always attend his arms. An usurper, named *Socinius*, was reduced and made a servant in the king's kitchen; but was afterwards hanged for theft. Ras Michael, notwithstanding all his skill in military affairs, was not able to get the better of Fasil; and his excessive cruelty, avarice, and ambition, disgusted every one. An attempt was even made to assassinate him; and his spiritual friend (Michael the archangel,

³⁸⁴ **Ethiopia.** Mr Bruce introduced to the ca.

³⁸⁵ Is promoted and held in great estimation.

³⁸⁶ His departure from the country.

³⁸⁷ Event of the war before he left the country.

Ethiopia. archangel, according to his own report, or the devil, according to that of the Abyssinians) at last forsook him; so that he was carried off prisoner by a party of the rebels. After this misfortune he was much dejected, imputing it to the want of the spiritual assistance just mentioned, and which it seems had withdrawn itself some time before. His wife Ozoro Ester, whom Mr Bruce characterises as the handsomest woman he ever saw, was in great favour with the king at the time our traveller left Abyssinia. As the king himself was a handsome young man, there is no improbability in supposing with Mr Bruce, that "they were not insensible to each other's merits;" and as she was sometimes honoured with a *private audience*, where Michael himself "bore no part in the conversation," we shall conclude our history of this singular empire by a conjecture, that soon after Mr Bruce's departure, Michael either died by course of nature, he being then very old, or was cut off by his enemies; on which Tecla Haimanout, having fully settled the affairs of his empire, became possessed of the beautiful Ozoro Ester, and commenced his reign with great glory.

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Geography
of ancient
Ethiopia.

With regard to the geographical description of ancient Ethiopia, little can be said; as not even the boundaries of the empire itself, much less those of the particular districts which composed it, were known. The ancient writers, however, agreed that it was very mountainous: but they mention no mountains of any consequence excepting Garbata and Elephas, whose situation is not well ascertained, tho' it is generally supposed that they answer to the mountains of Tigré. The most noted cities were Axum, Napata, Premis or Premnis, Melis, Mondus, Abalis, Mofylon, Caloe, Opone, &c.

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Customs of
the inhabi-
tants.

The nations which inhabited ancient Ethiopia have already been enumerated; and it is not to be supposed that all, or indeed any two of them, would agree in many respects. The ancient historians, however, give the following information. They had many laws which were very different from those of other nations; especially their laws relating to the election of kings. The priests chose the most reputable men of their body, and drew a large circle around them, which they were not to pass. A priest entered the circle, running and jumping like an *Egipan* or a satyr. He of those that were inclosed in the circle who first caught hold of the priest, was immediately declared king; and all the people paid him homage, as a person entrusted with the government of the nation by Divine Providence. The new-elected king immediately began to live in the manner which was prescribed to him by the laws. In all things he exactly followed the customs of the country; he paid a most rigid attention to the rules established from the origin of the nation, in dispensing rewards and punishments. The king could not order a subject to be put to death, though he had been capitally convicted in a court of justice; but he sent an officer to him, who showed him the signal of death. The criminal then shut himself up in his house, and was his own executioner. It was not permitted him to fly to a neighbouring country, and substitute banishment for death; a relaxation of the rigour of the law, with which criminals were indulged in Greece.

We have the following extraordinary information with regard to the death of many of their kings: The priests of Meroë, who had acquired great power there, when they thought proper, dispatched a courier to the

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king to order him to die. The courier was commissioned to tell him, that it was the will of the gods, and that it would be the most heinous of crimes to oppose an order which came from *them*. Their first kings obeyed these groundless despotical sentences, though they were only constrained to such obedience by their own superstition. Ergamenes, who reigned in the time of Ptolemy the second, and who was instructed in the philosophy of the Greeks, was the first who had the courage to shake off this iniquitous and sacerdotal yoke. He led an army against Meroë, where, in more ancient times, was the Ethiopian temple of gold; where he put all the priests to the sword, and instituted a new worship.

The friends of the king had imposed on themselves a very singular law, which was in force in the time of Diodorus Siculus. When their sovereign had lost the use of any part of his body, by malady, or by any other accident, they inflicted the same infirmity on themselves; deeming it, for instance, shameful to walk straight after a lame king. They thought it absurd not to share with him corporal inconveniences; since we are bound by the ties of mere friendship to participate the misfortunes and prosperity of our friends. It was even customary among them to die with their kings, which they thought a glorious testimony of their constant loyalty. Hence the subjects of an Ethiopian king were very attentive to *his* and their common preservation; and therefore it was extremely difficult and dangerous to form a conspiracy against him.

The Ethiopians had very particular ceremonies in their funerals. According to Ctesias, after having salted the bodies, they put them into a hollow statue of gold which resembled the deceased; and that statue was placed in a niche on a pillar which they set up for that purpose. But it was only the remains of the richest Ethiopians that were thus honoured. The bodies of the next class were contained in silver statues; the poor were enshrined in statues of earthen ware.

Herodotus* informs us, that the nearest relations of the dead kept the body a year in their houses, and offered sacrifices and first-fruits during that time to their deceased friend; and at the end of the year, they fixed the niche in a place set apart for the purpose near their town.

The Ethiopians made use of bows and arrows, darts, lances, and several other weapons, in their wars, which they managed with great strength and dexterity. Circumcision was a rite observed amongst them, as well as among the Egyptians, from very early antiquity; though which of these nations first received it, cannot certainly be known. The Ethiopian soldiers tied their arrows round their heads, the feathered part of which touched their foreheads, temples, &c. and the other projected out like so many rays, which formed a kind of crown. These arrows were extremely short, pointed with sharp stones instead of iron, and dipped in the *virus* of serpents, or some other lethiferous poison, in so much that all the wounds given by them were attended with immediate death. The bows from which they shot these arrows were four cubits long; and required so much strength to manage them, that no other nation could make use of them. The Ethiopians retreated fighting, in the same manner as the Parthians; discharging volleys of arrows with such dexterity and address whilst they were retiring full-speed, that they terribly galled the enemy. Their lances or darts were

5 H

of

Ethiopia.

Lib. iii.
24.

Ethiopia. of an immense size, which may be deemed a farther proof of their vast bodily strength.

Thus far chiefly with regard to the Ethiopians who lived in the capital, and who inhabited the island of Meroë and that part of Ethiopia which was adjacent to Egypt.

Diod. Sic.
p. 102.

There were many other Ethiopian nations, some of which cultivated the tracts on each side of the Nile, and the islands in the middle of it; others inhabited the provinces bordering on Arabia; and others lived more towards the centre of Africa. All these people, and among the rest those who were born on the banks of the river, had flat noses, black skins, and woolly hair. They had a very savage and ferocious appearance; they were more brutal in their customs than in their nature. They were of a dry austere temperament; their nails in length resembled claws: they were ignorant of the arts which polish the mind: their language was hardly articulate; their voices were shrill and piercing. As they did not endeavour to render life more commodious and agreeable, their manners and customs were very different from those of other nations. When they went to battle, some were armed with bucklers of ox's hide, with little javelins in their hands; others carried crooked darts; others used the bow; and others fought with clubs. They took their wives with them to war, whom they obliged to enter upon military service at a certain age. The women wore rings of copper at their lips.

Some of these people went without clothing. Sometimes they threw about them what they happened to find, to shelter themselves from the burning rays of the sun. With regard to their food, some lived upon a certain fruit, which grew spontaneously in marshy places: some ate the tenderest shoots of trees, which were defended by the large branches from the heat of the sun; and others sowed Indian corn and lotos. Some of them lived only on the roots of reeds. Many spent a great part of their time in shooting birds; and as they were excellent archers, their bow supplied them with plenty. But the greater part of this people were sustained by the flesh of their flocks.

The people who inhabited the country above Meroë made remarkable distinctions among their gods. Some they said, were of an eternal and incorruptible nature, as the sun, the moon, and the universe; others having been born among men, had acquired divine honours by their virtue, and by the good which they had done to mankind. They worshipped Isis, Pan, and particularly Jupiter and Hercules, from whom they supposed they had received most benefits. But some Ethiopians believed that there were no gods; and when the sun rose, they fled into their marshes, execrating him as their cruellest enemy.

These Ethiopians differed likewise from other nations in the honours which they paid to their dead. Some threw their bodies into the river, thinking that the most honourable sepulchre. Others kept them in their houses in niches: thinking that their children would be stimulated to virtuous deeds by the sight of their ancestors; and that grown people, by the same objects, would retain their parents in their memory. Others put their dead bodies into coffins of earthen ware, and buried them near their temples. To swear with the hand laid upon a corpse, was their most sacred and inviolable oath.

The savage Ethiopians of some districts gave their crown to him who of all their nation was best made.

Their reason for that preference was, that the two first gifts of heaven were monarchy and a fine person. In other territories, they conferred the sovereignty on the most vigilant shepherd; for he, they alleged, would be the most careful guardian of his subjects. Others chose the richest man for their king; for he, they thought, would have it most in his power to do good to his subjects. Others, again, chose the strongest; esteeming those most worthy of the first dignity who were ablest to defend them in battle.

The Jesuit missionaries were the first who gave any information to the Europeans concerning this country; and indeed, excepting them and the late accounts by Mr Bruce, we have no other source of information concerning it. The missionaries confirm what is said by the ancients, that Ethiopia is a very mountainous country. The provinces of Begemder, Gojam, Waleka, Shoa, &c. according to them, are only one continued chain of mountains. Many of them were said to be of such enormous height, that the Alps and Pyrenees are but mole-hills in comparison of them. Those called *Aorni* were said to be of this kind; but Mr Bruce informs us, that these accounts are greatly exaggerated. Amongst those mountains, and even frequently in the plains, there are many steep and craggy rocks to be met with of various and whimsical shapes; some of them so smooth, that men and oxen are craned up to the top by means of engines: but what is most surprising, the tops of these rocks are covered with woods and meadows, full of springs and streams of water; of the truth of which we have an attestation by Mr Bruce in his description of Lamalmon. The most remarkable of these, according to the authors we are now speaking of, is that called *Amba Geshen*, mentioned in the course of this article as one of the mountains used for a prison to the princes of the blood. Its top is described as only half a league in breadth, tho' it is said that it would require near half a day to go round it. Kircher mentions also a rock which resembles a mirror at a distance; though this is probably not to be depended upon.

The climate of Ethiopia varies, as may naturally be supposed, according to the situation and elevation of the ground. On the coast of the Red Sea, as well as the open flat parts of the country in general, the heat is intense, inasmuch that at Suakem, an island in the Red Sea, Gregory the Abyssine relates that it was so great, as to excoriate any part of the body exposed to the solar rays, melt hard sealing-wax, and sear a garment like red hot iron. In several districts, however, the heat is milder than in Portugal, and in Samen the air is rather cold than otherwise. In some other provinces the winter is very severe, though snow is seldom seen. Hail indeed sometimes falls, which resembles snow at a distance: and Mr Bruce mentions an account of snow having once fallen which lasted three days, and was looked upon to be a kind of prodigy. There are frequent and violent thunders, with excessive deluges of rain during one part of the year, and there are likewise violent storms of wind. The missionaries mention a kind of wind named *Sendo*, which, according to Gregory, may be seen like a serpent of vast magnitude with its head on the ground, and the body twisted in vast curls up to the skies. This, in all

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Account
of the mis-
sionaries.

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pro-

Ethiopia. probability, is no other than that violent species of whirlwind named *Typhon*, frequent in America and other warm countries; and its being visible is owing to the dust which it takes up in its passage.

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Mr Bruce's
account of
its divi-
sions.

Modern Ethiopia, or *Abyssinia*, as it is now called, is divided, according to Mr Bruce, into two parts, named *Tigré* and *Amhara*; though this rather denotes a difference in the language than the territory of the people. The most easterly province properly so called is *Mafuah*. It is of considerable length, but no great breadth; running parallel to the Indian Ocean and Red Sea, in a zone of about 40 miles broad, as far as the island *MASSUAH*. The territories of the *Baharnagash* include this province as well as the districts of *Azab* and *Habab*. In the former are mines of fossile salt, which in *Abyssinia* passes current instead of money. For this purpose the mineral is cut into square solid pieces about a foot in length. Here also is a kind of mint from which great profits are derived. The *Habab* is likewise called the land of the *Agaazi* or *Shepherds*; who speak the language called *Geez*, and have had the use of letters from the most early ages. This province was formerly taken by the Turks, when the rebellious *Baharnagash* *Isaac* called them to his assistance against the emperor *Menas*. From that time the office fell into disrepute, and the *Baharnagash* at present has much less power than formerly. The province of *Mafuah* is now governed by a Mahometan prince or officer called a *naybe*.

Tigré is bounded on the east by the territories of the *Baharnagash*, of which the river *Mareb* is the boundary on the east, and the *Tacazze* on the west. It is about 200 miles long from north to south, and 120 broad from west to east. All the merchandise sent across the Red Sea to *Abyssinia*, or from *Abyssinia* across the Red Sea, must pass through this province, so that the governor has his choice of it as it goes along. Thus the province itself is very wealthy; and as the *Abyssinian* fire-arms are brought from Arabia, the governors of *Tigré*, by purchasing quantities of them, may easily render themselves very powerful. No arms of this kind can be sent to any person without his permission; nor can any one buy till the governor has first had an offer.

Siré was some time ago united to *Tigré*, on account of the misbehaviour of its governor; but was disjoined from it at the time Mr Bruce was in *Abyssinia*, with the consent of *Ras Michael*, who bestowed the government of it upon his son. It is about 25 miles long, and as much in breadth. Its western boundary is the *Tacazze*.

Samen is a very mountainous province lying to the westward of the river *Tacazze*, about 80 miles long, and in some places 30 broad, though in most it is much narrower. It is mostly inhabited by Jews.

Begemder lies to the north-east of *Tigré*. It is about 180 miles long and 60 broad; bounded by the river *Nile* on the west. It comprehends the mountainous country of *Lasta*; and there are now several small governments dismembered from it. The inhabitants are fierce and barbarous, but reckoned the best soldiers in *Abyssinia*; and it is said that this province with *Lasta* can furnish 45,000 horsemen. It abounds with iron mines, which in *Abyssinia* would be very valuable if properly managed. It is also well stored with beautiful cattle. Near the south end it is cut into vast

Ethiopia. gullies, seemingly by floods, of which we have no account. This province is reckoned the great barrier against the incursions of the *Galla*; and though they have often endeavoured to make a settlement in it, they have never yet found it practicable. Several of their tribes have been cut off in the attempt.

Next to *Begemder* is the province of *Amhara*, in length about 120 miles, and somewhat more than 40 in breadth. It is very mountainous; and the men are reckoned the handsomest in all *Abyssinia*. In this province is the mountain or rock *Geshen*, formerly the residence of the royal family. This province is parallel to *Begemder* on the south; being separated from it by the river *Bashilo*. On the west it is bounded by the *Nile*. The river *Geshen* is another boundary.

Walaka lies between the rivers *Geshen* and *Samba*. It is a low unwholesome province, having upper *Shoa* to the southward. It was in this province that the only surviving prince of the family of *Solomon* was preserved after the massacre by *Judith*, formerly mentioned; and on this account great privileges were conferred upon the inhabitants, which in some degree continue to this day. The governor is considered as an ally, rather than a subject, of the emperor of *Abyssinia*; and to preserve his independency, he has allowed the *Galla* to surround his province entirely, yielding them up the territory of *Walaka* above mentioned. Trusting to the valour of his own people, he is under no apprehension of his barbarous neighbours the *Galla*. This province is also remarkable for the monastery of *Debra Libanos*, where the famous *Saint Tecla Haimanout*, the founder of the power of the clergy, was bred.

Gojam is remarkable for having in it the sources of the *Nile*. It is bounded on the north by the high mountains of *Amid Amid*, on the south by the river *Nile*, on the west by another river named *Gult*, and on the east by the river *Temci*; on the north-east it has the kingdom of *Damot*. It is about 40 miles long from north to south, and somewhat more than 20 in breadth from east to west. It is very populous, but the men are accounted the worst soldiers in *Abyssinia*. There is great plenty of very beautiful cattle.

Beyond the mountains of *Amid* on the east lies the country of the *Agows*; on the west it has *Buré*, *Umbarma*, and the country of the *Gongas*; on the south, those of *Damot* and *Gafat*; and *Dingleber* on the north.

Dembea occupies all the space along the lake of the same name from *Dingleber* below the mountains bounding *Guesque* and *Kuara*. Mr Bruce is of opinion, that the lake has formerly overflowed the whole of it; and the decrease of this lake he brings as an instance of the decrease of large pools throughout the world.

To the south of *Dembea* is the country of *Kuara*, bordering on that of the *Shangalla*, the *Macrobii* of the ancients. The neighbouring countries, inhabited by the pagan savages, produce gold, which is introduced in plenty into this province. None is produced in the province itself, nor indeed does Mr Bruce mention any part of *Abyssinia* where gold is naturally found. In the lower part of this country is a colony of pagan blacks named *Ganjar*; derived, according to our author, from the black slaves who came into the country with the Arabs after the invasion of *Mahomet*. These deserting their masters, formed the colony we speak of; but it is now more increased by vagabonds from other parts than by the multiplication of the inhabitants themselves.

Ethiopia. The governor of this country is one of the great officers of state: he has kettle-drums of silver, which he is allowed to beat through the streets of Gondar; a privilege allowed to none but himself. This privilege was conferred upon the first governor by David II. who conquered the country.

The frontier countries of Nara, Ras-el-Feel, Tchelga, &c. are wholly inhabited by Mahometans, and the government of them is usually given to strangers. The country is very hot, unwholesome, and covered with thick woods. The people are fugitives from all nations; but excellent horsemen, making use of no other weapon but the broad sword; with which, however inadequate we might suppose the weapon to be, they will attack the elephant or rhinoceros.

The most distinct idea of the situation of the Abyssinian provinces is to be had from the map which Mr Bruce has given of it in his 5th volume. According to this, the empire is bounded on the south by a vast chain of mountains, extending with very little interruption from 34° to 44° E. Long. and between 8° and 9° N. Lat. In the more prosperous times it extended beyond these southward, particularly into the kingdom of Adel; but the mountains just mentioned are undoubtedly to be reckoned its natural boundaries on this side. On the east and north-east it has the Red Sea, and on the south-east the kingdom of Adel. On the west and north its boundaries are less distinctly marked; having on both these quarters the barbarous kingdom of Sennaar, whose limits will no doubt frequently vary according to the fortune of war betwixt the two princes. From Arkeeko, situated near the foot of the Basalt mountains, in about 15° 30' N. Lat. it extends to near 7° N. Lat. where the mountains of Caffa, the most southerly province of Abyssinia, terminate. Along the coast of the Red Sea lie the territories inhabited by the Hazorta-Shiho, the district of Engana Shiho, and the kingdom of Dancali, including the territory of Azab and the salt-pits already mentioned. To the westward of these are the province or kingdom of Tigré, including the country of the Dobas, part of the kingdom of Bali, and that of Dawaro. Still farther west are those of Sirè, Lasta, Amhara, the greatest part of Bali, and part of Fatigar, which last reaches beyond the mountains. Proceeding still in the same direction, we come to Tcherkin, Tchelga, Abargale, Salao, Begemder, Shoa, and Ifat; reckoning always from north to south; Tcherkin, for instance, being to the northward of Tchelga, &c. Shoa extends a considerable way to the westward; so that, besides Ifat, it has to the south of it also the kingdoms of Hade and Cambut; the latter extending beyond the southern ridge of mountains. To the westward are Ras-el-Feel, Dembea, Gojam, and Damot; and beyond these are the kingdoms of Dembea, Bizamo, Gooderoo, and Guraque; those of Nare or Enarea and Caffa occupying the south-west corner of the empire.

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Climate.

With regard to the climate of Abyssinia, Mr Bruce does not mention any thing materially different from what has been already said; only he gives a very particular description of the rains which produce the inundation of the Nile; and of which the substance shall be given under that article. We shall therefore close our account of this country with an enumeration of its products, and some detail of the manners and customs of the present inhabitants.

The great difference of climate, owing to the vast extent and variety of elevation in different parts of this empire, is very perceptible in its soil and productions. The mountains in many places are not only barren, but altogether inaccessible, except by those who make it their constant practice to climb amongst them; and even by them they cannot be ascended without great difficulty and danger. The shapes of these mountains, as we have already had occasion to observe, are very strange and fantastical; exceedingly different from those of Europe; some resembling towers and steeples, while others are like a board or slate set up on end; the base being so narrow, and the whole mountain so high and thin, that it seems wonderful how it can stand. In the valleys, however, and flat parts of the country, the soil is excessively fruitful, though in the warmest places grain cannot be brought to perfection. Wine is also made only in one or two places; but the greatest profusion of fruits of all kinds is to be met with every where, as well as many vegetables not to be found in other countries. There is a vast variety of flowers, which adorn the banks of the rivers in such a manner as to make them resemble fine gardens. Among these a species of roses is met with, which grows upon trees, and is much superior in fragrance to those which grow on bushes. Sena, cardamom, ginger, and cotton, are likewise produced here in great quantities. Among the variety of rare plants to be met with in Abyssinia, Mr Bruce particularly describes the following.

1. The papyrus, the ancient material for paper; which our author supposes to have been a native of Ethiopia, and not of Egypt as has been supposed. 2. Baleffan, balm, or balsam plant; a tree growing to the height of 14 or 15 feet, and used for fuel along with other trees in the country. It grows on the coast of the Red Sea, among the myrrh trees behind Azab, all the way to Babelmandel. This is the tree producing the balm of Gilead mentioned in Scripture. 3. The sassa, myrrh, and opocalpasum trees. These grow likewise along the coast of the Red Sea. The sassa or opocalpasum is used in manufactures; and, according to our author, resembles gum *adragant*, probably *tragacanth*. The tree which produces it grows to a great size, and has a beautiful flower, scarce admitting of description without a drawing. 4. The *ergett*, a species of the mimosa, is of two kinds; one called *ergete y'dimmo*, or the bloody *ergett*, from the pink colour of its filaments; the other *ergett el krone*, or the horned *ergett*, with a flower resembling the *acacia vera* or Egyptian thorn. These were both found on the banks of a river named *Amo*, near the great lake Dembea. 5. *Ensete*, an herbaceous plant, growing in Narea, in swampy places; but it is supposed to grow equally well in any other part of the empire where there is heat and moisture sufficient. It forms a great part of the vegetable food of the Abyssinians. It produces a kind of figs, but these are not eatable. When used for food, it is to be cut immediately above the small detached roots, or perhaps a foot or two higher, according to the age of the plant. The green is to be stripped from the upper part till it becomes white; and when soft, it affords an excellent food when eaten with milk or butter. 6. *Kolquall*, a kind of tree, only the lower part of which is woody, the upper part being herbaceous and succulent. The flowers are of a beautiful golden colour, and the fruit turns to a deep crimson; so that the trees

make

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Plants de-
scribed by
Mr Bruce.

Ethiopia. make a very beautiful appearance. The whole plant is full of a very acrid and caustic milk. 7. Rack is a large tree, growing not only in Abyssinia but in many places of Arabia Felix. Its wood is so hard and bitter, that no worm will touch it; for which reason it is used by the Arabs for constructing their boats. It grows, like the mangrove, among the salt-water of the sea, or about salt springs. 8. Gir-gir, or geshe-el-aube; a kind of grass found about Ras-el-Feel, growing to the height of about three feet four inches. 9. The kantuffa, a very noxious species of thorn, much more troublesome than any with which we are acquainted, and growing to the height of eight or more feet. The flowers have a strong smell like the flower mignonet. 10. The gaguedi, is a short tree only about nine feet high, a native of Lamalmon. The flowers, which are yellow and very beautiful, turn towards the sun like those of the helianthus. 11. The wansey, a tree common throughout all Abyssinia; flowers exactly on the first day the rains cease. It grows to the height of 18 or 20 feet; having a thick bark and close heavy wood; the first part of which is white, but the rest of a dark colour. The flowers are of a beautiful white colour; but it does not appear to possess any other remarkable property, though it is held in great estimation by the Abyssinians, and is even worshipped by the Galla. 12. The farek, or Bauhinia acuminata, grows in the country immediately adjacent to the sources of the Nile; being found by Mr Bruce scarce 400 yards distant from the fountain. 13. Kuara, is a beautiful tree, growing in the south and south-west parts of Abyssinia. It has a fruit like a bean, of a red colour, which in the early ages was made use of as a weight for gold and diamonds; and hence Mr Bruce is of opinion that the name of the imaginary weight *carat* is derived. 14. The walkuffa, grows in the hottest parts of Ethiopia. It is a flowering tree, with beautiful white blossoms, which do not appear till towards the middle of January. The flowers have no smell, and are accounted pernicious to bees. The wood is very heavy. 15. The wooginoos, or Brucea antidysenterica, is common throughout the whole empire, but principally on the sides of the valleys. It is a sovereign remedy against the dysentery, a very common and fatal disease in hot countries. Mr Bruce had experimental proof of its antidysenteric virtues. 16. Cusso, or Bankia anthelmintica, is a very beautiful and useful tree, being a strong anthelmintic, and used as such by the Abyssinians. Every person there, whether male or female, is troubled with that kind of worm called *ascarides*; a great number of which are evacuated every month, and the evacuation is promoted by an infusion of this plant. While taking this medicine, the patients sequester themselves from all their acquaintance, and keep close at home. It is said, that the want of this medicine in other countries is the reason why the Abyssinians do not go out of their own country; or, if they do, that they are short-lived. 17. Teff, is a kind of grain sown generally throughout Abyssinia; and constituting the bread commonly made use of by the inhabitants. They have indeed plenty of wheat, and are as skilful in forming it into bread as the Europeans; but this is only made use of by people of the first rank: however, the teff is sometimes of such an excellent quality, that the bread made from it is held in equal estimation with the finest wheat. From the bread made of this

grain a fourish liquor called *bouza* is prepared, which is used for common drink like our small beer. A liquor of the same kind, but of inferior quality, is made from barley cakes. Some have been of opinion, that the use of teff occasions the worms above mentioned; but this is controverted by Mr Bruce. Nook, a plant not to be distinguished from our marigold either in shape, size, or foliage, is also sown very generally over the country, and furnishes all Abyssinia with oil for the kitchen and other uses.

Abyssinia abounds with a vast variety of quadrupeds both wild and tame. Immense numbers of cattle every where present themselves, some of them the most beautiful in the world. Some have monstrous horns, said to be capable of holding 10 quarts each; but this, as our author informs us, is a disease which proves fatal to them. Buffalos are here met with in great numbers, and are very fierce and untractable; but there are no such animals as carnivorous bulls, which have been said to exist in this and other internal parts of Africa. Antelopes and other wild animals are met with in great numbers in the uncultivated parts; feeding chiefly on the leaves of trees. They abound most of all, however, in those parts which have been once cultivated, but since desolated by the calamities of war; and where wild oats abound in such quantities as to hide them from pursuit. Hyenas, lions, foxes, jackals, wild boars, &c. are also found, as well as the elephant, rhinoceros, cameleopard, and others of the larger and more uncommon kinds. Great havoc is made in the cultivated fields by multitudes of baboons, apes, rats, and mice. There is plenty of hares; but these being reckoned unclean, as well as wild boars, are not used as food. The rivers abound with crocodiles and hippopotami, at least the Nile, and those large streams which flow into it: but a great number have water in them only during the rainy season, and these have neither fish nor any animal that feeds upon them.

The number of birds in this country is immense; nor are those of the carnivorous kind at all deficient. Great numbers of eagles, vultures, hawks, and others of that kind, are met with, and come punctually every year after the tropical rains have ceased. They feed at first upon the shell-fish which are met with in great quantities on the edges of the deserts, where they had lived in the salt springs; but, being forced from their natural habitations when these springs were swelled by the rains, are afterwards left to perish on dry land. When these fail, their next resource is from the carcases of the large animals, such as the elephant and rhinoceros, which are killed in the flat country by the hunters. Their next supply is the multitude of rats and field-mice which infest the country after harvest. The vast slaughter of cattle made by the Abyssinian armies, the multitude of persons killed whose bodies are allowed to rot on the field of battle, &c. furnish them also with another resource. These supplies, however, all fail at the beginning of the rainy season, when the hunters and armies return home, and the vast quantity of water which continually overflows the ground renders it impossible for them to find any other food.

There are other birds which feed upon insects, and multitudes which live on grain or seeds of various kinds; all of which are amply supplied by the immense quantity of fruits and berries which grow in Abyssinia, and are ripe at all seasons of the year. A very remarkable

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Quadrupeds.

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Birds.

Ethiopia. markable particular concerning this is, that the trees which bear fruit all the year round do not carry it always in the same place. The west side is that which blossoms first, and where of consequence the fruit first comes to perfection; the south side succeeds, and goes through the same process; after which, the north blossoms in like manner; and last of all is the east side, which produces flowers and fruit towards the beginning of the rainy season. All the trees of Abyssinia are ever-green; and their leaves are of a thick leathery consistence, and highly varnished to enable them to resist the violent rains which fall during a certain season. The granivorous birds have likewise this advantage, that the rains do not fall at the same time all over the country. It is intersected by a chain of mountains that divide the seasons also; so that they have but a short way to fly in order to become birds of passage, and supply themselves with such food as is necessary for them beyond the mountains. All the pigeons, of which there are many species, are birds of passage, excepting one kind. The owls are extremely large and beautiful, but few in number. There is a great variety of swallows, several kinds of which are unknown in Europe; but, says our author, "those that are common in Europe appear in passage at the very season when they take their flight from thence. We saw the greatest part of them in the island of Masuah, where they lighted and tarried two days, and then proceeded with moon-light nights to the south-west." The large birds which reside constantly among the mountains of Samen and Taranta have all their feathers tubular, the hollow part being filled with a kind of yellow dust which issues out in great abundance on hunting them. This was particularly observed by Mr Bruce in a species of eagle which he calls the *golden eagle*; and the dust being viewed through a microscope with a very strong magnifying power, appeared like fine feathers. The crows are spotted white and black, almost in equal proportions. The raven has his feathers intermixed with brown; the tip of his beak white, and a figure like a cup or chalice of white feathers upon his head. Our author saw no sparrows, magpies, nor bats; neither are there many water fowl, especially of the web-footed kind; but there are vast numbers of storks, which cover the plains in May, when the rains become constant. There are no geese, excepting one species called the *golden goose* or *goose of the Nile*, which is common all over Africa; but there are snipes in all the marshes.

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Fishes.

Our author describes very few fishes; though he says that an account of these, and other marine productions of the Red Sea, which he has painted and collected, would occupy many large volumes, and the engraving cost a sum which he could not by any means afford. He mentions one named *binny*, which is good food, and grows to a pretty large size; that from which he took the drawing being about 32 pounds weight. Its whole body is covered with beautiful scales resembling silver spangles.

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Reptiles.

Of the reptiles in Abyssinia Mr Bruce describes the fly already mentioned as destructive to cattle, and which in his 5th volume he calls *latfalva*. He gives a particular description of a kind of lizard, and of the cerastes or horned serpent; but denies that serpents are numerous in Abyssinia, as almost all authors have supposed, and as we should be led naturally to suspect.

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Few serpents in Abyssinia.

He vouches also for the power that some persons have of enchanting serpents and scorpions, which in some is natural, in others communicated artificially by certain medicines. He prevailed upon those who knew the secret to prepare him by these means as they had done others; but, notwithstanding this assistance, he acknowledges, that when it came to the trial his heart always failed him.

Mr Bruce gives an ample description of the manners of the Abyssinians, who in some respects are barbarous beyond measure. The continual state of warfare in which they are engaged, must no doubt contribute to confirm them in their barbarity. That, again, according to Mr Bruce, arises from an error in the regulations concerning the succession. The crown is indeed hereditary in the line of Solomon, but it depends on the minister to choose the particular person who is to enjoy it; and as it is always his inclination to have the government in his own hands, he never fails to choose an infant, who is seldom suffered to live after he comes to the years of maturity. Thus perpetual wars and commotions take place, inasmuch that the ravenous birds, as has been observed, find one great supply of food in the slaughters made by the Abyssinians of one another. All authors indeed agree that the devastations committed by the armies of this country are excessive; inasmuch, that after a long encampment is removed, nothing is to be seen all around the place where it was but bare earth. When an army marches through the country, says Mr Bruce, "an inconceivable number of birds and beasts of prey, especially the former, follow it from the first day of its march to its return; increasing always in proportion the more it advances into the country. An army there leaves nothing living behind, not the vestige of an habitation; but the fire and the sword reduce every thing to a wilderness and solitude. The beasts and birds unmolested have the country to themselves, and increase beyond all possible conception. The slovenly manner of this savage people, who, after a battle, bury neither friends nor enemies; the quantity of beasts of burthen that die perpetually under the load of baggage, and variety of mismanagement; the quantity of offal, and half-eaten carcases of cows, goats, and sheep, which they consume in their march for sustenance; all furnish a stock of carrion sufficient to occasion contagious distempers, were there not such a prodigious number of voracious attendants who consume them almost before putrefaction. There is no giving the reader any idea of their number, unless by comparing them to the sand of the sea. While the army is in motion, they are a black canopy which extends over it for leagues. When encamped, the ground is discoloured with them beyond the sight of the eye; and all the trees are loaded with them."

The prodigious number of criminals executed for high treason, whose bodies are cut in pieces and thrown about the streets, invite the hyenas to the capital, in the same manner that the carrion of the camp invites the birds of prey to follow it. The method of keeping off these voracious animals is certainly very curious. "An officer (says Mr Bruce) called *Serach Massery*, with a long whip, begins cracking and making a noise worse than 20 French postillions at the door of the palace before the dawn of day. This chases away the hyenas and other wild beasts: this too is the signal for the king's rising, who sits in judgment every morning

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Manners, &c. of the Abyssinians.

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Method of settling the succession to the crown detrimental to the empire.

404

Excessive destruction by the Abyssinian armies. Bruce's Travels, vol. v. p. 160.

405

Immense number of birds which follow them.

406

Curious method of keeping off the hyenas from the king's palace.

Ethiopia.

ing fasting; and after that, about 8 o'clock, he goes to breakfast."

407
Method of
anointing
and crown-
ing the
king.

From these and other circumstances we should be apt to imagine that the Abyssinians, instead of becoming more civilized, were daily improving in barbarity. The king is anointed at his election with plain oil of olives; "which (says Mr Bruce) being poured upon the crown of his head, he rubs into his long hair indecently enough with both his hands, pretty much as his soldiers do with theirs when they get access to plenty of butter." In former times, however, matters seem to have been conducted with more decency. Socinios, the greatest monarch that ever sat on the Abyssinian throne, was crowned, after having gained a great victory over the Galla, in a very different manner, and with the ceremonies which we are told were in use among the ancient kings of Tigré. At that time he had with him an army of about 30,000 men; and was besides attended by all the great officers dressed in the gayest manner, as well as by the ladies of the first quality in the empire. The king himself, dressed in crimson damask, with a great chain of gold about his neck, his head bare, and mounted on a horse richly caparisoned, advanced at the head of his nobility, passed the outer court, and came to the paved way before the church. Here he was met by a number of young girls, daughters of the *Umbares* or supreme judges, together with many noble virgins standing on the right and left of the court. Two of the noblest of these held in their hands a crimson cord of silk, somewhat thicker than common whip-cord, stretched across from one company to another, as if to shut up the road by which the king was approaching the church. When this cord was prepared and drawn tight about breast-high by the girls, the king entered; advancing moderately quick, and showing his skill in horsemanship as he went along. Being stopped by the tension of the string, the damsels asked, Who he was? To this he answered, "I am your king, the king of Ethiopia." But they replied, "You shall not pass; you are not our king." He then retired some paces, and again presented himself. The question was again put, "Who he was?" To which he answered, "I am your king, the king of Israel." But the same reply was still given by the girls. The third time, on being asked, "Who he was?" he answered, "I am your king, the king of Sion:" and drawing his sword, he cut the cord asunder. The damsels then cried out, "It is a truth, you are our king; truly you are the king of Sion." On this they began to sing Hallelujah, and were joined by the whole army and the rest of the king's attendants. Amidst these acclamations the king advanced to the foot of the stair of the church, dismounted, and sat down upon a stone; which, in Mr Bruce's opinion, was plainly an altar of Anubis or the Dog-star. After the king, came a number of priests in proper order. The king was first anointed, then crowned, and accompanied half up the steps by the singing priests. He stopped at a hole made on purpose in one of the steps, where he was fumigated with myrrh, aloes, and cassia: after which divine service was celebrated; and he returned to the camp, where 14 days were spent in feasting and rejoicing.

Ceremonies of this kind are now given over on account of the expence. Our author was informed by Tecla Haimanout, that when he was obliged to retire into Tigré from his enemies, Ras Michael had some

thoughts of having him crowned in contempt of his enemies; but by the most moderate calculation that could be made, it would have cost 20,000 ounces of gold, about 80,000 l. sterling; on which all thoughts of it were laid aside.

With regard to the manners of the Abyssinians, they are represented by Mr Bruce as highly barbarous. Their continual warfare inures them to blood from their infancy; so that even children would not have the least scruple at killing one another or grown up persons if they were able. Many shocking instances of hardness of heart are related by our author in Tecla Haimanout himself, though otherwise an accomplished prince. Their cruelty displays itself abundantly in the punishments inflicted upon criminals, one of which is flaying alive, as has been already related of Wqosreka. Cutting in pieces with a sabre is another; and this is performed, not by executioners, whose employment is reckoned disgraceful as in this country, but by officers and people of quality. So little is this thought of indeed in Gondar, the capital of the empire, that Mr Bruce happening to pass by an officer employed in this work, who had three men to dispatch, the officer called to him to stop till he had killed them all, as he wanted to speak to him upon a matter of consequence. Stoning to death is a capital punishment likewise common in this country; and usually inflicted on Roman Catholics if they happen to be found, or upon other heretics in religion.

It is not to be supposed that people who regard the lives of one another so little, will show much compassion to the brute creation. In this respect, however, the Abyssinians are cruel and savage beyond all people on the face of the earth. There are many instances of people eating raw fish or flesh, and we call them barbarous that do so; but what name shall we give to those who cut off pieces of flesh from animals while still living, and eat it not only raw but still quivering with life! Mr Bruce labours much to prove, that the way of eating not raw, but *living* flesh, was customary among the nations of antiquity: but whatever be in this, he is the only author who mentions it directly; and it is on his single testimony that the fact is established. The Jesuits mentioned in their books, that the Abyssinians eat raw flesh, but not a word of eating it in this manner; and indeed there are some circumstances which he himself relates seemingly very difficult to be reconciled with known and indubitable facts. He informs us, for instance, that when at no great distance from Axum, the capital of Tigré, he fell in with three soldiers "driving a cow. They halted at a brook, threw down the beast, and one of them cut a pretty large collop of flesh from its buttock; after which they drove the cow gently on as before." In another place he tells us, that the flesh was taken from the upper part of the buttock; that the skin was flapped over the wound, fastened with a skewer, and a cataplasm of clay put over all. Now it is known to anatomists, that no piece of flesh can be cut off without destroying a muscle; and that the muscles of the buttocks are subservient to the motion of the legs. The Abyssinians therefore must have been expert anatomists to know how to cut off such muscles as would allow the creature still to go on; and if their repast had been two or three times repeated, it is plainly impossible that the cow could at any rate have stirred a step. In his

Ethiopia.

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Manners of
the Abyssinians.

409
Their horrid manner
of feeding.

Ethiopia. description of their feasts there is more consistency; for there the animal is tied so that it cannot move: after stripping off the skin, the flesh of the buttocks is cut off in solid square pieces, without bones or much effusion of blood; and the prodigious noise the animal makes is a signal for the company to sit down to table. Every man sits between two women, having a long knife in his hand. With this he cuts the flesh, while the motion of its fibres is yet visible, into pieces like dice. These are laid upon pieces of bread made of the grain called *teff*, already mentioned, after being strongly powdered with Cayenne pepper and fossil salt.

Ethiopia. They are then rolled up like as many cartridges; the men open their mouths, stooping and gaping like idiots, while the women cram them so full of these cartridges, that they seem every moment in danger of being choked; and in proportion to the quantity their mouths can hold, and the noise they make in chewing, they are held in estimation by the company. All this time the animal bleeds but little: but when the large arteries are cut and it expires, the flesh becomes tough; and the wretches who have the rest to eat, gnaw it from the bones like dogs!

END OF THE SIXTH VOLUME.

BIBLIOTHECA
REGIA
MONACENSIS

E R R A T A.

- Page 281. col. 1. line penult. For *Stirlingshire*, read *Perthshire*.
 367. col. 2. line 15. from bot. For *Barbary*, read *Barabra*. The same repeated line 2. from bot.
 424. col. 2. Dele *Cavallo's Electricity* on the margin.
 428. col. 1. line 13. from bot. For *a*, read *u*.
 462. col. 2. line 4. from bot. For 74. read 73.
 463. col. 2. last line. For 74. read 73.
 471. col. 2. line 11. from bot. For "fig. 9." read "fig. 8, 9."
 477. col. 1. line 30. For *B*, read *b*.
 478. col. 1. line 35. Dele n^o 2.
 483. col. 1. margin. For Plate CLXXVIII. read Plate CLXXX.
 504. col. 2. line 15. For *I*, read *T*.
 510. col. 1. line 19. For *ABO*, read *ABC*, and dele "fig. 69."
 527. col. 1. line 26. After the word *conductor*, read "fig. 85."
 533. col. 1. line penult. For "fig. 6." read "fig. 4."

DIRECTIONS FOR PLACING THE PLATES OF VOL. VI.

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